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THE UNIVERSITY OF ALBERTA

THE NATURE OF SOCIAL DEFICITS IN CHILDREN WITH AUTISM

BY

JOYCE ELAINE MAGILL

(C)

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

IN

FAMILY STUDIES

FACULTY OF HOME ECONOMICS

EDMONTON, ALBERTA

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Abstract

A series of three studies described behaviors used by 11 higher-functioning persons with autism (ages 6 - 20 years) during interactions. These behaviors were compared to those used by normally-developing and behaviorally-disordered children who were matched to the children with autism. Interactions were observed in three semi-natural settings: free play with peers; structured, task-oriented activities with peers; and greetings to a familiar adult. On-line coding supplemented by videotapes was used to record the nonverbal and verbal behaviors used to initiate, maintain, and terminate interactions in these settings.

Several consistent findings emerged across the studies. Analyses at the level of discrete basic behaviors found few significant differences across groups in isolated behaviors such as looking at the other person involved in the interaction. Nevertheless, autistic children did smile significantly less often than other children in several of the situations. In addition, persons with autism used combinations of the basic behaviors (e.g., looking at the child plus talking and gesturing) less frequently and in different ways than did other children. Children with autism initiated fewer interactions than other children although it was possible to observe at least two initiations per person. Interactions following the autistic person's initiations were more likely than those of other children to last less than 30 seconds.

Theoretical implications of identifying the most consistent social

deficits in autism at the level of coordination of behaviors were considered. Practical ramifications for the design of interventions to promote successful social interaction were also discussed.

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I could never have reached this point in my life alone. Even in the process of studying interaction, I was privileged to participate in interactions with many people who gave me support, direction, and encouragement. Foremost amongst these people were my cosupervisors. One of them stimulated my interest in autism and walked me painstakingly through the process of doing solid meaningful applied research. She helped me to believe that this project was possible and valuable. The other one consistently forced me to see beyond the trees to appreciate the forest of broader application.

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THE NATURE OF SOCIAL DEFICITS IN CHILDREN WITH AUTISM

Introduction

Few persons exist in total isolation. Therefore, certain basic abilities in social relations are required. In order to be considered fully social one must have the intent to influence others and possess the ability to participate in reciprocal, coordinated patterns of behavior (Dawson & Galpert, 1986; Hobson, 1983). Participation in interaction facilitates the development of characteristics such as language which are uniquely human (Heiss, 1981).

Nevertheless, there are individuals who rarely interact. From early infancy, persons with autism have been described as having a "profound disruption in the biologically-based capacity for a quality of 'personal relatedness' with others" (Hobson, 1983, p.23). Specific behavioral deficits include a failure to cuddle, lack of anticipatory posturing prior to being picked up (Kanner, 1943) and a failure to seek out a parent when hurt or upset (Rutter, 1983). Older persons with autism have been described as lacking social skills (e.g., mutuality, reciprocity, synchronization) which are exhibited at some level by normally-developing infants in the first six months of life (Dawson & Galpert, 1986; Hobson, 1983).

Although the development of interactional skills is not fully understood, explanations of normal development must be able to account for persons such as those with autism who fail to develop or have severe delays in these basic skills. It has been argued that humans are born with an innate, biologically-based capacity for interaction

which develops within the facilitative context of the parent and child relationship (Heiss, 1981). Differential reinforcement and attribution of social meaning to the child's sensorimotor behaviors by the caregiver presumably lays the groundwork for development of intent and reciprocity in social interactions. Whether such a theory can account for the pattern of social deficits exhibited by persons with autism remains to be seen.

Any explanation of an autistic person's social deficits must also take into account the other co-existing areas of dysfunction which may influence social developmental processes. To be diagnosed as having autism, a child also displays qualitative abnormalities of communication and restricted and stereotyped patterns of behavior or interests, with some autistic symptoms appearing prior to the age of three years (Rutter & Schopler, in press). Attempts have been made to explain the triad of symptoms as manifestations of a single basic deficit. Rutter (1983) explored the possibility of an underlying cognitive deficit. However, the nature of the cognitive deficit and its ability to explain all aspects of autistic persons' behaviors and especially their social abnormalities have yet to be demonstrated. Even when persons with autism no longer display marked abnormalities in linguistic or cognitive functioning, abnormalities in social relations persist (Rutter, 1983). A study of the outcomes for nine high-functioning (M age=27.1 years, M IQ=103, good language skills) males with autism found that all of them had social impairments and only one had any kind of a friendship relationship (Rumsey, Rapoport, & Sceery, 1985). Thus, social deficits merit further study in their own right

although the other facets of autism must not be ignored.

One important issue in understanding persisting social deficits is determining the appropriate level of analysis. Dawson and Galpert (1986) stated that autistic children have deficits involving basic social competencies normally developed during infancy upon which normal social relations are built. However, to date there is little empirical evidence to support this claim. Thus, it could be argued that an appropriate entry level of analysis is that of behavioral topography (Greenwood, Walker, Todd, & Hops, 1981) which focuses on the description of basic discrete social behaviors and their use in particular social situations.

Using a developmental perspective, the following three studies focused on the nonverbal and verbal topography of social interactions by higher-functioning children and adolescents with autism in semi-natural settings. These studies attempted to identify specific deficits in rudimentary behaviors which might contribute to impaired functioning in higher level social behaviors such as peer relations. Although impaired social relationships constitute one of the diagnostic criteria for autism, there has been relatively little systematic study of social development and social behaviors of autistic persons (Hobson, 1983; Schopler & Mesibov, 1985). Research in this area contributes to our understanding of the deficits underlying autism while testing the ability of theories to explain the nature of these deficits.

Study of the social behaviors of persons with autism within a developmental framework has been recommended by several researchers

(Dawson & Galpert, 1986; Hobson, 1983; Lord, 1984a). Such an approach assumes that normal social development proceeds in a sequential manner. For example, one could predict that before children use coordinated combinations of social behaviors, they must have developed competency in using the individual component parts which are later combined (e.g., Brownell, 1986). Use of a sequence for social development facilitates differentiation of behaviors that are delayed from behaviors that are aberrant at any age. The extent to which the social deficits of autism reflect a simple delay in social development is not clear (Sigman, Mundy, Sherman, & Ungerer, in press) though some researchers (Wenar, Ruttenberg, Kalish-Weiss, & Wolf, 1986) have reported that autism in its most severe form cannot be attributed solely to a delay.

Social abilities cannot be considered static in either normally-developing or autistic children. Attention must be given to how these abilities develop. In the present series of studies, this was done through inclusion of a relatively broad age range of both normally-developing and autistic children and adolescents. Although the sample size was small and some comparisons were not always possible (e.g., study III), examining the differences associated with age was deemed important. While a cross-sectional study is not ideal for studying development, it is expedient and allows identification of the salient variables which can then be studied longitudinally.

A developmental perspective also assumes that development in cognitive, social, and emotional areas is closely linked (Dawson & Galpert, 1986). For persons with autism, there is a strong link

between the degree of retardation, the severity of autism (Schopler, Reichler, DeVellis, & Daly, 1980) and the long-term outcome (Rutter, 1978). Autistic children with IQs over 70 (approximately one-quarter of the autistic population) have better social adjustment than those below 70 (Bartak & Rutter, 1976) and are more likely to gain useful speech (Rutter, 1978). Studies of social behavior must control for cognitive functioning because of these interconnections and because of the importance of differentiating deficits specific to autism from social delays associated with general mental retardation (Wing & Gould, 1979). Therefore, the present studies controlled for cognitive abilities by focusing on higher-functioning autistic persons, behaviorally-disordered children matched by IQ to the autistic persons, and younger normally-developing children assumed to have a mental age similar to the other two groups.

At the same time it must be noted that the linkage across developmental areas is even less straight-forward in autism than in the normally-developing population. For example, Lord (1984b) found that children with autism had more difficulty in a language comprehension task (following simple instructions to move familiar objects in a doll house) than could be explained solely on the basis of cognitive delays. The autistic children (M age=11 years, M mental age=4.8 yr.) were less able to follow instructions than were mentally-handicapped children of the same chronological and mental age and 2-year-old normally-developing children. Additionally, persons with autism may evidence widely disparate abilities both within and across domains (Lord & Garfin, 1986) and possess adequate abilities in areas such as

language, but fail to use those abilities in socially-appropriate ways.

Educational and social experience may account for some of these widely disparate abilities and explain some of the differences between autistic and normally-developing children's social skills. To control for these factors, children and adolescents with behavior disorders were included in the study and were matched to children with autism by gender, chronological age (to control for developmental factors), verbal skills (to control for the role of verbal skills in social interactions), and cognitive functioning (to control for the social stigma associated with lower IQ). Children with behavior disorders resembled those with autism in that they were known to have deficits in social relationships, were limited in their social experiences, had probably been rejected by their peer group, and had spent substantial amounts of time in special education facilities. These children did not form a homogeneous diagnostic group but included several of the psychiatric disorders associated with social impairments. However, they were not autistic and were assumed to not have the same basic social deficits associated with autism.

In addition to determining how to best study interactions from a developmental perspective, it is important to determine the most appropriate way to delimit the broad topic of interaction. The interactions of interest in this series were defined as interpersonal events in which a minimum of two persons acknowledged the presence of the other and in which they exchanged signals or actions either verbally or nonverbally (Beisler, 1986; Greenwood et al., 1981). Knox's model (a modification of work by Williams, Hamre-Nietupski,

McDaniel-Marx, and Wheeler's work, as cited in Knox, 1985) of verbal and nonverbal interactions served as the guide for looking at the interaction process. The model is based on the assumption that interaction is a bi-directional process consisting of three essential components. Each of the components was studied, although only study III examined all three components within the same interaction.

The first component is "initiation" of the interaction. In some manner, one person must signal another person that he or she is willing and interested in interacting. To be termed socially competent one must have the ability to successfully initiate interactions (Howlin, in press; Strain, 1985). Study I focused on the behavioral topography and outcome of initiations which autistic children and adolescents directed towards peers during free play. In study II, the nonverbal and verbal behaviors used in a more conventionalized form of initiation, namely greetings to a familiar adult, were examined. Greetings directed to peers were considered in study III.

According to Knox (1985), the second component of an interaction is termed "responding" and consists of the response to the initiation and the processes whereby the interaction is sustained. Without some form of action by the second person following an initiation, an interaction or coordinated pattern of actions cannot be sustained. This second component is one of the aspects of interaction investigated in study III within a structured, task-oriented setting.

Finally, the act of termination or ending of an interaction is the third component of Knox's (1985) model. Refusing to respond to the initiation of the other child, failing to reciprocate during an

interaction, or responding in a manner which leaves no basis for continuation of the interaction results in the termination of that interaction. Study III examined how children and adolescents with autism brought an interaction to an end.

The three components of the model were studied within three different interaction settings. However, each setting placed together persons who were familiar with each other. Doyle, Connolly, and Rivest (1980) reported that a child is more socially active with a familiar versus unfamiliar peer. Thus, observing children with familiar adults and peers facilitated interactions and increased the probability of being able to observe at least one of these low-incidence behaviors. The children were also observed in the context of familiar and enjoyable activities. The activities were carefully chosen to ensure that a failure to use appropriate social behaviors was not an artifact of tasks that were not within the cognitive and communicative capabilities of both interactants.

The background and rationale for each study, the relevant literature, methods and procedures, and results of each of the three studies are reported in separate sections of the paper. A summary of overall conclusions reached in the studies and implications of the results for our understanding of autism are discussed in the final chapter.

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STUDY I

Initiations to Peers

Peer relations have been viewed as central to normal child development (Hartup, 1980). Many social, cognitive, communicative, and physical skills are believed to be learned primarily in interactions with peers (Asher, Renshaw, & Hymel, 1982; Hartup, 1983). Indeed, peer relations are distinct from adult-child relationships; they require somewhat different skills, are largely voluntary, provide an opportunity for reciprocal interactions with an equal (Lord & Garfin, 1986), and appear later in the developmental sequence (Field, 1980).

Autistic persons have marked and persisting difficulties in peer relations as evidenced by a low rate of interaction and failure to make friends (Bartak & Rutter, 1976; Howlin, in press). Consequently, the current study focused on the peer interactions of higher functioning individuals with autism. The first issue one must address in such a study is that of determining who is an autistic person's peer. Autism is characterized by an uneven pattern of abilities. Therefore, is a peer a person of the same chronological age, verbal ability, social maturity, or mental age as the autistic child (Lord & Garfin, 1986)? Although another autistic person is similar in all of these areas, interaction with a person who also has social deficits does not facilitate gains in social skills. Lord and Garfin (1986) concluded that peers for autistic persons must be defined according to the goals for each specific situation. Because of the substantial contribution of verbal skills to the behaviors we were observing, in this study

peers were children who were similar to the autistic children in verbal intelligence but younger in chronological age.

The peer interactions of behaviorally-disordered children were also studied. These children could be grouped with those whom Asher and Dodge (1986) described as sociometrically rejected by peers and displaying disruptive, aggressive behavior with long-term adjustment problems. Overall, these children were expected to more closely resemble normally-developing children than autistic children but to differ from normal children in the use of specific behaviors (e.g., smiling) in peer interactions (Panella & Henggeler, 1986).

Initiations

The present study of peer interactions focused on the first observable social signal beginning an interaction (Greenwood, Walker, Todd, & Hops, 1981) as well as the result of that initiation. Corsaro (1981) reported that 83.5 percent of all peer interactions in a preschool setting lasted less than ten minutes. Approximately one half of the attempts to begin an interaction met with initial resistance. Thus, normally-developing children required not only the ability to find persons with whom to interact on a frequent basis but also the ability to make repeated initiations if the first attempt was ignored. Understanding how normally-developing children execute this process of initiation is important in understanding children with difficulties in this area (Odom, Hoyson, Jamieson, & Strain, 1985)

Initiating interactions is particularly problematic for persons with autism (McHale, 1983; Shafer, Egel, & Neef, 1984). Lord (1984)

observed no more than four initiations in 15 minutes of free play between triads of autistic classmates; only one of six autistic children made initiations to nonhandicapped playmates during baseline observations for an intervention program. While other behaviors (e.g., distance from other children, time attending to partner) increased following intervention programs using normally-developing peers, autistic children continued to initiate infrequently (Lord & Hopkins, 1986; Odom & Strain, 1986). In two studies, autistic children initiated during five to thirteen percent of the observation periods (Lord & Hopkins, 1986; Shafer et al., 1984) compared to over fifty percent for normally-developing children (Lord & Hopkins, 1986).

An initiation has been defined in a variety of ways. Strain and his associates (Odom et al., 1985; Strain, 1983) defined an initiation as any one of a set of behaviors occurring either three seconds before or after another child's social behavior. Such a definition allowed the inclusion of behaviors which may sustain rather than begin an interaction. Others (Dowdney, Mrazek, Quinton, & Rutter, 1984; Lord & Hopkins, 1986; Shafer et al., 1984) required a 10 to 20 second interval of non-interaction preceding the initiation. Because the current study focused on behaviors used to begin an interaction, it was important to differentiate initiations from behaviors sustaining the interaction. Therefore, an initiation was defined as any overt behavior (e.g., vocalizations, gestures, use of objects) in which a child engaged with the potential to lead to an interaction following at least 20 seconds of non-interaction. Although this definition involved somewhat arbitrary and subjective decisions, it was verified by observing

whether the behaviors resulted in interactions (see below).

Behavioral Aspects of Initiations

Studies of autistic children's initiations have often described behavior in functional categories such as complimentary statement, play organizer, and physical assistance (Strain, 1983; Odom et al., 1985). The behavioral topography of the initiation or behaviors preceding the initiation were not usually described although Van Engeland and associates (1985) emphasized the importance of such observations. Lord and Hopkins (1986) focused on specific behaviors such as vocalizations, gestures, physical contact, and use of objects, a method the present study followed with further elaboration of specific behaviors.

a. Eye-to-face gaze

Eye-to-face gaze appears during the first four months of life (Argyle & Cook, 1976) and is believed by many to form the base upon which other social behaviors build (Dawson & Galpert, 1986; Mirenda, Donnellan, & Yoder, 1983; Vandell & Mueller, 1980). Gaze is used to initiate an interaction (Argyle & Cook, 1976; Mirenda et al., 1983) by signalling that communication channels are open (Knapp, 1978). Therefore, recording where a child was looking was important in the study of initiating behaviors.

Gaze aversion or the failure to look directly at another person was described by Tiegerman and Primavera (1984) as the most noticeable feature of autistic children. Freeman et al. (1981) found that one of the characteristics which differentiated both high- and low-IQ autistic children from control groups was abnormal eye contact. Bartak and

Rutter (1976) reported that this abnormality was more noticeable in early childhood. Other studies of eye-to-face gaze in adult-child interactions indicated that autistic children did not differ from control groups in the amount of looking (Mundy, Sigman, Ungerer, & Sherman, in press) but did differ in the way gaze was used (Mirenda et al., 1983). None of these studies described the use of gaze during initiations. The present study measured where the child was looking during an initiation to a peer. It was predicted that autistic children, and especially younger autistic children (which in this study referred to children ages 6-13 years), would look at the other person less often than would children in other diagnostic groups.

b. Smiling

Another behavior emerging in the first months of life which serves as an important social cue is smiling (Argyle & Cook, 1976). In infants mutual gazing often elicits smiling (Argyle & Cook, 1976). Smiles directed towards peers can be seen by the time the child is six months of age (Vandell & Mueller, 1980) and are one of the most frequently used actions to initiate an interaction (Hartup, 1983).

Autistic children manifest distinct impairments in use of social smiles (Freeman et al., 1981). They are capable of smiling although they rarely do so, showing a flatness of affect (Langdell, 1981). In the present study, it was predicted that persons with autism would smile less during initiations than children in both other diagnostic groups. A study by Panella and Henggeler (1986) formed the basis for a prediction that children with behavior disorders would also smile less than normally-developing children.

c. Verbalizations

Six month old infants use vocalizations to initiate peer interactions (Hartup, 1983; Vandell & Mueller, 1980). As children mature, they become capable of communicating ideas and intentions to other children and use this communicative behavior to initiate shared play. Many studies of children's entry or initiation strategies have dealt with the kinds of statements children make when joining an existing group (Dodge, Schlundt, Schocken, & Delugah, 1983; Putallaz, 1983). Thus, verbalizations appear to play an important role in beginning peer interactions.

Studies of initiations by children with autism have also looked at the content of verbal statements (e.g., Odom & Strain, 1986) and the use of any form of vocalization (Lord & Hopkins, 1986). The Lord and Hopkins (1986) study of moderately retarded autistic children (ages 8-12), all of whom were capable of some spontaneous speech, found that only 3.3% of initiations to nonhandicapped peers involved any form of vocalizations. Thus, it was hypothesized that younger autistic children (ages 6-13 yrs.) in the present study would use verbalizations less often than other children of similar ages.

d. Use of objects

Another behavior children use to initiate an interaction is object offers (Vandell & Mueller, 1980). Many of the interactions of younger children are object-centered. Such contacts have been described as important to the development of social interactions (Mueller & Brenner, 1977). Lord and Hopkins (1986) found that 65% of initiations by normally-developing children to the autistic children in their study

involved an object. The children, ages five to ten years, either offered an object or demonstrated its use. Six moderately-retarded autistic children (ages 8-12) observed in the same study used objects in 98% of their initiations. Therefore, it was predicted that younger autistic children (ages 6-13) would make greater use of objects than their normally-developing counterparts.

e. Other behaviors

Other behaviors used in initiations include touching, hitting, approaching, gesturing, and imitating (Field, 1980; Vandell & Mueller, 1980). Gesturing and approaches were recorded in this study but were used only to determine the complexity of the initiations as discussed below. Moreover, because use of imitation was addressed in other studies (e.g., Lord & Hopkins, 1986) and because the amount of physical contact has been so low in previous research (less than 1% - Lord & Hopkins, 1986), these behaviors were not included in the present study.

f. Coordination of behaviors

All of the behaviors mentioned above are present in the normally-developing child by approximately 12 months of age (Vandell & Mueller, 1980). Following acquisition of individual behaviors, the next development is the coordination of these discrete behaviors which enables the child to perform several together or in rapid succession. Thus, the child can look at another child while calling his/her name, and offering him/her a toy. Mueller and Brenner (1977) termed such abilities complex or <u>coordinated</u> socially directed behavior. According to their terminology, simple behaviors included visual regard in association with one other behavior (e.g., calling). Mueller

and Brenner (1977) and Brownell (1986) have suggested that the opportunity to participate in peer interactions facilitates the development of coordinated behaviors. Brownell (1986) noted that there were some age-related constraints in that 24-month-old children produced more coordinated behaviors than did 18-month-old children. However, the factors affecting such constraints are not yet known.

For persons with autism, it must be determined whether social deficits are associated with basic discrete behaviors, with the coordination of individual behaviors in more integrated initiations, or with both aspects. Most autistic children have had limited opportunities to participate in peer relations (Lord, 1984) and this lack of experience may contribute to a delay in the development of coordinated social behaviors. Lord and Garfin (1986) speculated that a failure to coordinate verbal initiations with eye contact and other attention-getting behaviors may be the reason for the lack of success of some verbal initiations by autistic children. Lord (1984) also noted that following intervention programs, autistic children continued to have difficulties in coordinating social behaviors. Thus, it was predicted that autistic children, regardless of age, would use fewer complex or coordinated behaviors to initiate interactions than would children in other diagnostic groups. Overall, autistic children were expected to differ from normally-developing children in use of coordinated behaviors even when the use of discrete behaviors was not different.

Outcome of Initiations

With increasing age, normally-developing children make more initiations and are involved in longer, more elaborated interactions (Greenwood et al., 1981; Holmberg, 1980). On the other hand, the developmental course and outcome of autistic children's initiations is not clear. Most studies to date were part of intervention programs where the peer was externally motivated to continue the interaction after the initiation. Over the course of one of these studies, Lord (1984) reported that mean length of interaction between dyads of autistic and normally-developing children, while still brief, increased from a single initiation-response sequence to an average of at least two sequences. It is not clear whether this change could be attributed to the behavior of the autistic children or to the normally-developing children's increasing skill in persisting in the interaction.

The present study looked at three outcomes of initiations. The interaction following an initiation was termed "ongoing" if it continued 30 seconds or longer (Vandell & Mueller, 1980), "terminated" if it lasted less than 30 seconds, or "no response" if there was no apparent response. In measuring outcome, the contribution of the individual and the contribution of the dyad must be recognized. A sustained interaction is dependent upon both the response of the other person and the quality of the initiation. Recognizing this tension, it was predicted that for whatever reasons, autistic children would participate in fewer ongoing interactions than their normally-developing counterparts. Younger autistic children would have the least number of ongoing interactions compared to all other groups.

The Problem of Intentionality in Initiations

Unless an interaction includes the intent to influence the other person in some way, it cannot be truly termed an interaction (Heiss, 1981). The problem of how to determine intent or meaning of a given behavior was a factor in this study of initiations. For example, looking at another child can serve to begin an interaction. How does one determine if a child is simply looking in the direction of the other child with an unfocused gaze, is looking but has no desire to interact with that child, or is looking at the other child and planning on starting an interaction (or hoping that the other child will do so)? To infer intent from a single behavior is very difficult (Prizant & Wetherby, 1985). In order to deal with this problem and limit the inferences drawn from single behaviors, in this study constraints were placed on the observations. For example, looking at another child was not considered an initiation unless it was accompanied by one other behavior (see methods section for more details). It was recognized that this method might result in an underestimation of initiations.

Overview of Hypotheses

For study I, the hypotheses emphasized three areas of social functioning. First, autistic children were expected to have a lower proportion of initiations resulting in ongoing interactions. The second area focused on determining if the social deficits of autistic children occurred only in discrete behaviors. Autistic children were hypothesized to use gaze, smiling, verbalizations, and object use as part of their initiations less often than children in other diagnostic

groups with one exception; younger autistic children were expected to show a greater proportion of object use in initiations than were other groups. The third area dealt with integration of the discrete behaviors. It was predicted that individuals with autism would use fewer coordinated behaviors in initiating meaningful social interactions than would individuals in other diagnostic groups.

Methods and Procedures

General Context

All subjects except one boy were observed in one of three summer daycamps based in a children's hospital. One five day camp was held for each of the following age groups: 6-9 years, 10-12 years, and 13 years or older. Each age group consisted of three to five children from the two psychiatric groups described below and eight to ten normally-developing children. Transportation was provided for the children in the two psychiatric groups and, in lieu of transportation, normally-developing children received a small stipend for their participation in the research projects. One subject (behaviorally-disordered) was seen in the context of a five week evening group for persons 13 years and older in the same children's hospital. The children attending the group were primarily those who had attended the summer day camp.

Sample

The subjects included 20 males and 10 females, all of whom were white with the exception of one boy of mixed race and one Inuit girl

(behaviorally-disordered) adopted during infancy by a white family. The subjects belonged to one of three diagnostic groups.

The autistic group consisted of 11 subjects (7 males, 4 females) between the ages of 7 years 8 months and 19 years 5 months who had been diagnosed as having autism by a psychiatrist and a clinical psychologist. Each person met DSM III (American Psychiatric Association, 1980) and Rutter and Schopler's (in press) criteria for autism. For clinical reasons, two autistic children (one male, one female) were added to the daycamp and the study too late to allow matching with control children during the daycamp. All autistic group members were acquainted with each other, having participated in at least one set of evening social groups prior to the daycamp.

The behaviorally-disordered group consisted of seven males and three females between the ages of 7 years 3 months and 17 years. One male was observed during an evening social program, serving as a match for the two autistic children mentioned above. The behaviorally-disordered children comprised a heterogeneous group of nonautistic children actively involved in psychiatric treatment and selected from special classes in the hospital where the daycamp was located and in the public school system. All the children had severe difficulties in peer relations. They were equivalent to the autistic children in language skills (i.e., using scores derived from verbal IQ on the WISC-R and chronological age, autistics=10.72 years, behaviorally-disordered=10.55 years) and roughly equivalent in chronological age (see Table I-1). Two diagnoses, made by a child psychiatrist and a clinical psychologist, accounted for all but three children. In

Table I-1

Age, Sex, and Intelligence Scores of the Three Diagnostic Groups[a]

	Younger Autistics	Younger B. D.*	Younger Normals	Older Autistics	Older B. D.	Older Normals
Total no.	6	5	4	5	5	5
-girls	2	2	2	2	2	1
-boys	4	3	2	3	3	4
Age range	7-8 to 12-4	7-3 to 11-0	6-4 to 10-5	13-9 to 19-5	12-10 to 17	10-7 to 15-1
M CA	9.85 (1.84)	9.15 (1.60)	8.29 (1.46)	15.58 (2.01)	14.48 (1.42)	13.02 (1.56)
M Verbal IQ	82.67 (16.34)	91.60 (9.73)		90.60 (15.11)	86.40 (14.22)	
M Verbal MA	8.08 (2.09)	8.46 (2.02)		13.90 (1.41)	12.63 (3.07)	
M Perf. IQ	84.17 (15.56)	89.00 (5.83)		89.00 (13.96)	93.40 (4.63)	

a- all standard deviations are in brackets

* B. D.= behaviorally-disordered children

children younger than 13 years, the primary diagnosis was attention deficit without hyperactivity, with or without language delay. For children 13 years of age or older, the primary diagnosis was schizophrenia with adolescent onset, with or without cognitive delay. The remaining children had been diagnosed as having an oppositional disorder (one 7 year old) and a mixed conduct-emotional disorder (one 9 year old and one 17 year old). Several of the behaviorally-disordered children were acquainted with each other from school or treatment settings and evening social groups.

Eight to ten normally-developing children who had no known history of psychiatric or cognitive disorders were recruited from community groups (e.g., church groups, Boy Scouts, Girl Guides) for each of the daycamps and evening group. The general goal was to have their mean chronological age be approximately 80% of the chronological age of the children in the other two groups in order to control for the below average IQs and verbal skills of the psychiatric groups. Of the 34 normally-developing children who participated in the program, 9 children and adolescents (6 males, 3 females) were randomly selected before the camp to serve as controls for children in the psychiatric groups in the research projects. These children were between the ages of 6 years 4 months and 15 years 1 month.

Measures

The purpose of the observational codes was to describe specific communicative behaviors associated with children's spontaneous initiations to each other. An initiation was defined as any overt

behavior in which a child engaged that had the potential to lead to an interaction. Two behaviors, physically approaching and looking at another person, were not scored as an initiation if no other accompanying behaviors indicated an intent to initiate. When these behaviors occurred together (e.g., looking at a child while walking towards him/her) or in conjunction with other behaviors (e.g., looking at a child while smiling), they constituted an initiation.

Six behaviors were noted in recording initiations: direction of gaze, smiling, vocalizations, whole body movements, gestures, and object use (see Table I-2 for operational definitions). Direction of gaze was included in each observation and was coded as either (a) looking at the person to whom the initiation was directed, (b) looking away from the probable recipient of the initiation, or (c) looking at an object such as a toy being offered or acted upon by the recipient. Eye-to-eye gaze was not included because in the present setting accurate differentiation between face gazing and gazing at other parts of the recipient's body was not possible (Argyle & Cook, 1976). Using the appropriate letter code, the occurrence of any of the five other behaviors was then recorded for each observation along with direction of gaze. Thus, one entry of an initiation might be LO-T-O. This might describe a child who, while looking at his ball (LO), bounces it towards another child (O) and calls out "Catch" (T).

Entries were made whenever any <u>one</u> of the six target behaviors changed. Thus, the complete record of the initiation and the behaviors preceding the initiation for the child with the ball might read: (a) LC (Billy directed his gaze to John), (b) LO-O (Billy looked away from

Table I-2

Behavioral Definitions

LC= looks at the other child. Can include any part of the body. (if looks at own body, code as LA; if relevant to interaction code as LO).

LO= looks at the object being used or at another child's object. If looks at object not directly involved in current interaction code as LA.

LA= looks away from other child; target's nose and eyes pointed away, unfocused looking, or looks at another child not involved in the interaction.

S = smiles or laughs, upturned corners of mouth. (does not include mannerisms such as repeated grimacing)

T = talks, vocalizes, sings, grunts.

A = approaches, moves in the direction of other person, leans toward other person (does not include rocking or repetitive mvts.).

G = gesture- points, nods, shakes head, reaches for. Contributes to communication (does not include flapping or finger flicking).

O = object use or offer of objects.

Initiation= Any overt behavior in which a child engages following a period of 20 seconds or more of non-interaction which has the potential to lead to an interaction with another child.

Interaction= exchange of signals- mutual gaze, interaction with toys (e.g., running a truck into another child's vehicle), talking (directed to another child as measured by content or by gaze).

John and bounced a ball), (c) LC-O (Billy looked at John and bounced a ball), and (d) LO-T-O (described above). For the purposes of this paper, only the actual initiations (e.g., item d above) were analyzed.

Prior to the daycamps, two observers practiced coding videotapes of autistic, behaviorally-disordered, and normally-developing children engaged in free play. After definitions of each code were clarified, the observers began on-line codings because videotapes were not well-suited for following one child to the point of initiation. Practice sessions were held at an integrated daycare. Two observers used identical lists of target children generated in the same fashion as for the actual daycamp (see below) and independently observed 20 minutes of free play. Interrater reliability was never below 95% for the presence of an initiation or the presence of the individual behaviors which constituted the initiation. Rates of occurrence rather than nonoccurrence were used to compute reliabilites because nonoccurrence was so common that reliability estimates based on agreement that behaviors had not occurred would have been highly inflated. Reliability was calculated by subtracting the number of disagreements from the number of agreements, dividing by the number of occurrences in total and multiplying by 100.

Procedures

All of the children involved in the daycamps attended an orientation session two to three weeks prior to the daycamp. Behaviorally-disordered and autistic children attended one session to explain the format and general purpose of the daycamp. They were told

that they were expected to be nice to the other children attending daycamp and show them around. Parents gave consent for their child's participation in the research at that time (see Appendix A). Normally-developing children attended a separate orientation. They were told that some of the children at the daycamp had problems with language and social skills and needed to spend time with "regular kids". They were told that it was their job to help the others play and to be nice to them. The children were also warned that they would see some unusual behaviors which they were to ignore. If they had any questions or needed help, they were to find a counsellor. More specific information (e.g., each child's diagnosis) was not given to the normally-developing children. The children and their parents were also told about the general purpose of the research and informed consent obtained.

Parents could observe all aspects of the program and remove their child at any time. The children were free to refuse to participate in any aspect of the research although there were no refusals. Because the rooms were large with activities spread throughout them, and because observations were relatively non-intrusive and occurred in one way or another all day long, in most cases the children ignored both the cameras and the observers.

General Format

The daycamp format for the different age groups was very similar, although furniture, toys, and games were modified according to the age of the children. Many of the activities required at least two people (e.g., air hockey, pingpong). Observations at each daycamp were made

during seven (five for the evening group) 20 to 30 minute unstructured free-play periods. These periods took place over the five days of the daycamp and occurred in three different rooms, each approximately 8 X 12 metres in size. Two observation periods were held on the second and third days of each camp.

The number of children in the area during the observations fluctuated from 4 to 18 according to the day and time. Occasionally, children left the room briefly for other program related activities. These departures and subsequent returns allowed observers to code the children's behavior from the time they entered the room until initiations were attempted. Instructions to the children were limited to telling them that they had 20 to 30 minutes in which they could play. All children were encouraged in a general fashion to make sure that everyone had someone with whom to play. Adults played a supervisory role, intervening only to discourage negative interactions or markedly inappropriate play between children.

Observational procedures

During free-play, two observers sat in the room with the children and made independent on-line recordings of each initiation observed. In addition, continuous video-recordings were made by two partially-hidden videocameras (Sony 1640, 1610) fixed at opposite ends of the room. The cameras covered about 80% of the room. The recordings were used for three purposes: (a) as reliability checks of on-line observations whenever possible, (b) as confirmation of a 20 second period of noninteraction prior to each initiation because changing from

one subject to another sometimes made it impossible for on-line observers to determine this, and (c) as confirmation of on-line codings as to whether or not the interaction had continued for 30 seconds (an "ongoing" interaction) or if it had terminated after an immediate response. Videotapes were reviewed within one to two hours of the actual play periods.

Order of observation was determined such that observers watched the same child approximately ten percent of the time. Based on comparisons of these observations before videotapes were reviewed, the observers showed 94% to 100% agreement on the occurrence of initiations and the exact behaviors involved. Disagreements were checked on the videotapes when possible and resolved through discussion.

During the first two play periods of the daycamp, each observer worked from a randomly generated list of five to six children. These lists were counterbalanced across diagnostic groups so that children from each group were observed with equal frequency by each observer and with equal frequency across the first two sessions. The observer followed the first child listed who was not currently interacting until he or she made an initiation, became the recipient of another child's initiation resulting in an ongoing interaction, or until seven minutes elapsed. The next child on the random list was then followed.

For the remaining five sessions, names of children with one or fewer initiations to date were incorporated into the randomly generated list two to three times as often as names of other children. This procedure was warranted because the goal of this study was to describe the quality of initiations and it was desirable to have six to ten

initiations per child. In an attempt to reach this goal, two autistic children were observed for more than 50 minutes. During this time only two initiations per child occurred. These two children spent most of their time alone or responding briefly to the initiations of others. In the case of three normally-developing and two behaviorally-disordered children, difficulties in observing a sufficient number of initiations were not due to their isolation but due to their tendency to initiate quickly and sustain the interaction once it had begun. It was possible to observe four to nine initiations for each of them.

Despite increasing the frequency of observations for specific children, the number of initiations were still significantly different as measured by a univariate ANOVA, $F(2,27)=5.13$, $p=.01$. A Scheffe procedure confirmed that the autistic children initiated significantly fewer times ($M=5.09$) than did children in both other groups ($Ms=7.70$, 7.89)(see Table I-3).

Results

Homogeneity of variance was measured for all relevant analyses using Cochran's C. There were only two variables (talking and object use) that did not have homogeneous variance when subjects of all ages were included. Because differences were predicted only for the younger group on these two variables, they were not included in the preliminary multivariate analysis.

A two-way (age by diagnosis) MANOVA with four dependent variables was performed: age, $F(4,21)=3.07$, $p=.039$; diagnosis, $F(8,40)=2.08$, $p=.06$; and interaction between age and diagnosis, $F(8,40)=1.93$, $p=.083$.

Table I-3

Number of Initiations

	Autistics	B. D.*	Normals
Sample size	11	10	9
Mean number (SD)	5.09 (2.34)	7.70 (2.31)	7.89 (1.97)
Range	2-10	5-12	4-10

* B.D.=behaviorally-disordered children

Results of the univariate tests associated with each of the dependent variables are discussed in the following sections. In addition to testing differences in group means, we were interested in looking at the results for individuals. Thus, one chi square analysis was performed for each of the six dependent variables and significant differences reported in association with the univariate results.

I. Outcome of the initiation

It was predicted that autistic children, regardless of age, would have a lower proportion of initiations resulting in ongoing interactions than children in other diagnostic groups, and that there would be age effects within the autistic group. These hypotheses were supported. A univariate ANOVA revealed a main effect for diagnosis, $F(2,24)=3.66$, $p=.041$. Autistic children had a significantly lower proportion ($M=32.8\%$) of initiations resulting in ongoing interactions than did the normally-developing children ($M=59.8\%$). The mean for the behaviorally-disordered children was in the middle ($M=42.4\%$). Younger children had a lower proportion of initiations resulting in ongoing interactions (see Table I-4) than older children, $F(1,24)=6.49$, $p=.018$. The younger autistic children had significantly fewer ongoing interactions ($M=15.7\%$) than older autistic children ($M=53.4$) while younger behaviorally-disordered ($M=32.4$) and normally-developing ($M=59.3$) children were not significantly different than older behaviorally-disordered ($M=52.4$) and normally-developing children ($M=60.4$).

These differences may have been due to children with autism receiving no response to their initiations either because they

Table I-4

Percent of Initiations Resulting in Ongoing Interactions

A. By Diagnostic Group

	Autistics		B. D.*		Normals	
	Younger	Older	Younger	Older	Younger	Older
Sample size	6	5	5	5	4	5
Total initiations	35	21	41	36	33	38
Percent ongoing (SD)	15.7 (14.9)	53.4 (19.2)	32.4 (21.4)	52.4 (20.3)	59.3 (21.6)	60.4 (27.6)
	32.8 (25.5)		42.4 (22.3)		59.8 (23.7)	

B. By Age Group

	Younger	Older
Sample size	15	15
Total initiations	109	95
Percent ongoing (SD)	32.9 (25.2)	55.3 (21.4)

* B. D. = behaviorally-disordered children

initiated to autistic children (who were less likely to respond) more often than did other children or because other children responded differently depending upon the child's diagnosis. In terms of "no response" to initiations, differences between groups were not significant (p=.14) although autistic children did have a higher proportion (M=23.5%, SD=16.7) than did behaviorally-disordered (M=11.5, SD=9.8) and normally-developing children (M=12.0, SD=12.1). Likewise, autistic children were not more likely to initiate interactions with autistic persons than were other children (p=.25); they initiated to normally-developing children as often as did the other children.

II. Basic behaviors used in initiations

(a) Autistic children were expected to look at the target of their initiation during a lower proportion of initiations than were children in other diagnostic groups. Marked age effects were also expected within the autistic group. These hypotheses were not supported. No significant group or age differences occurred for direction of gaze. Children with autism actually looked at the target of their initiation during slightly more initiations (M=63.4%, SD=29.3) than did children with behavior disorders (M=56.9%, SD=21.0) while normally-developing children looked at the target child the most (M=75.6%, SD=17.6). Three children with autism and three normally-developing children looked at the recipient child each time they initiated. All of the children looked at the other child during at least one initiation.

It was interesting to note the relatively large proportion of initiations during which children from all groups looked at an object

at the point of initiation. Percentages ranged from 19.1% (SD=15.4) for normally-developing children to 35.2% (SD=18.6) for behaviorally-disordered children with autistic children in the middle (M=28.2%, SD=28.8).

(b) Differences were anticipated between the younger diagnostic groups in the frequency of talking in initiations. A univariate ANOVA for the younger children found no significant differences. Normally-developing children talked during 78.3% (SD=11.4) of their initiations while children with autism talked during 77.8% (SD=18.7) and behaviorally-disordered children talked during 73.2% (SD=9.4).

(c) Autistic children, regardless of age, were predicted to smile during a smaller proportion of their initiations than children in the other diagnostic groups. There was no main effect for diagnosis [$F(2,24)=0.60$, $p=.55$] or age [$F(1,24)=3.41$, $p=.077$] on smiling but there was a significant interaction between age and diagnosis [$F(2,24)=3.49$, $p=.047$]. Posthoc comparisons revealed no developmental differences between younger (M=18.2%, SD=19.3) and older (M=7.6%, SD=11.2) children with autism ($p=.35$). However, there were differences between younger (M=8.3%, SD=16.5) and older (M=33.6%, SD=16.6) normally-developing children ($p=.02$) and between younger (M=7.4%, SD=10.2) and older (M=25.8%, SD=20.4) children with behavior disorders ($p=.07$).

(d) Younger autistic children were expected to use objects more during initiations than were younger normally-developing children. This hypothesis was not supported. Younger autistic (M=16.5%, SD=15.4) and normally-developing (M=12.8%, SD=8.8) children were very similar in

the frequency of object use during initiations while younger children with behavior disorders used objects the most (M=31.0%, SD=30.4). There were also developmental differences, F(1,24)=5.53, p=.027; younger children used objects more (M=19.7%, SD=19.6) than older children (M=6.1%, SD=9.5).

III.Coordination of behaviors in initiations

It was predicted that autistic children would use fewer coordinated behaviors to initiate than would children in the other diagnostic groups. This hypothesis was not supported. There was no main effect for diagnosis [F(2,24)=1.4, p=.27] or age [F(1,24)=2.04, p=.17].

Discussion

As in the studies reviewed earlier (Lord & Hopkins, 1986; Odom & Strain, 1986), the autistic children in this study initiated fewer interactions than did behaviorally-disordered and normally-developing children. The encouraging finding is that all of these relatively high-functioning children made some spontaneous peer-directed initiations. However, despite rather extreme lengths of observations only two initiations were recorded for one younger and one older autistic child.

Fifty percent of the older autistic children's initiations as compared to fifteen percent of the younger autistic children's initiations resulted in interactions lasting longer than thirty seconds. However, one cannot assume that there are developmental differences with older autistic children having better interactional

skills (although one would certainly hope that was the case). Rather, it may be that older normally-developing target children were better able to help sustain the interaction once it had been initiated than were younger normally-developing children. One example is that of an older girl with autism who approached another girl and sniffed her hair. The normally-developing girl responded by talking to the autistic girl and involving her in an activity. Such examples of building on a very unusual initiation were not noted with the younger children.

Irrespective of the explanation for the differences associated with age, one must still determine what it is that accounts for the differential outcome of initiations. One possibility is that there is something about the quality of the initiation which inhibits interaction beyond a simple initiation-response sequence. A second possibility is that the children with autism may not be able to maintain their part in the interaction and thus they may end the interaction in under thirty seconds. This possibility is addressed in study III. In actuality, the problem may lie in both poor quality initiations and a paucity of suitable behaviors to maintain the interaction once it has begun.

Contrary to expectations, there were few differences between children with autism and normally-developing children in the proportion of initiations which contained specific social behaviors such as looking at the other person or talking. Similarly, no differences emerged in the use of coordinated behaviors in initiations.

However, differences were noted in the use of smiles. Adolescents

with autism failed to follow the pattern of increased use of smiles with age exhibited by the other diagnostic groups. Although a sampling bias due to more severely-disabled persons remaining in programs until they are older (Dawson & Fernald, in press) might explain these results, it is highly unlikely with our particular sample. The older and younger group had similar numbers of individuals who were mildly autistic. Neverthless, it is unlikely that differences in smiling could account for the brief interactions following the initiation, especially in light of the relative success of older autistic children's initiations. As simple explanations based on discrete behaviors such as smiling and looking have not explained the differential outcome of the initiations, further studies are needed.

Certain aspects of the methodology may have contributed to a failure to find marked differences between groups. A small number of observations for two of the autistic children may have been problematic, although obtaining an average of five observations of a low-incidence behavior for this population may counterbalance this limitation. The necessity of placing constraints on the behavioral coding system to deal with intentionality may have also influenced the results. Certain behaviors had to be accompanied by other behaviors before they were assumed to be an initiation. Thus, simple behaviors used as part of unsuccessful initiations were ignored. This could account for a failure to find differences in the use of coordinated behaviors during initiations. A study of greetings (study II) was conducted during the daycamp to control for this problem by studying a more structured situation in which children were explicitly told to

initiate. In that study, all behaviors could be assumed to be part of the initiation process.

A failure to distinguish between particular looking behaviors may have comprimised the results. Although there were no group differences in looking at the other person during an initiation, actual eye-to-face gaze was not differentiated because of difficulties in accurate observation. However, it is possible to distinguish eye-to-face gaze from eye-to-body gaze from distances under three metres (Knapp, 1978). Therefore, this distinction was made in study III.

In summary, few differences emerged in the discrete social behaviors used by higher-functioning autistic children to initiate interactions with peers as compared to matched control groups. In fact, for direction of gaze, autistic children looked more like normally-developing children than did behaviorally-disordered children. Only in smiling did autistic children fail to show the increase that the other groups evidenced with development. However, something was clearly different about the younger autistic children's initiations as indicated by their low rate of successful interactions compared to the other groups. It was also interesting that younger behaviorally-disordered children showed the same phenomenon though to a lesser extent than autistic children. Various alternative explanations have been raised and will be addressed in the following studies.

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STUDY II

Behaviors Used to Greet a Familiar Adult

Human interactions cannot occur until there is an acknowledgment, in some manner, of the existence of the other person (Krivonos & Knapp, 1975). This acknowledgment often takes the form of a highly conventionalized and culturally influenced set of verbal and nonverbal behaviors. Krivonos and Knapp (1975) state that the success of the subsequent interaction is attributable, at least in part, to the appropriateness of this acknowledgment or greeting.

Greetings, a unique form of interaction initiators, serve several functions. They affirm the existence of a previous relationship (O'Leary & Gallois, 1985), reveal information about that relationship (Krivonos & Knapp, 1975), and ease the transition into the main purpose of the interaction (Laver, 1975). These functions are accomplished through a series of nonverbal behaviors such as establishing eye contact, approaching, gestures, smiling, and shaking hands, which are followed by or performed simultaneously with verbal exchanges.

The process whereby ritualized greeting behavior is acquired has not been studied extensively (Corsaro, 1979). Keane and Conger (1981) reported that there was little evidence of formal introduction behavior in three to five year olds. Corsaro (1979), in an extensive study of children in the same age range, found that verbal greetings constituted only two percent of the strategies used to join or begin interactions. Nonverbal entry into the play area followed by production of a variant of the ongoing behavior being used by the other children was the most

successful strategy. He also noted that at this age access strategies were much more complex than were terminating strategies. The nonverbal behavioral topography of the various strategies was not described.

By the time children are ten years of age they have acquired some formal strategies. Newcomb and Meister (1985) reported that third and fourth graders who were high on social effectiveness often began an interaction with an unfamiliar peer by an exchange of greetings. A study of 10 year old boys (Evans, Wittner, & Patton cited in Krivonos & Knapp, 1975) noted that many of the behaviors used such as smiles, eye contact, and verbal salutes were like those used by adults. However, there were also some unique behaviors which adults rarely used such as hitting and making undistinguishable sounds.

The study of greeting rituals in adults has been much more extensive and provides the background for looking at the individual behaviors which constitute greetings. The establishment of eye contact appears to be one of the first and most universal of the behaviors used (Ellgring, 1984). Smiling often occurs in association with eye contact and is a common feature of greeting rituals (Kendon, 1977). Other behaviors include gestures, moving towards the other person, hand contacts, and stereotyped verbal exchanges (Knapp, 1978b; Krivonos & Knapp, 1975; Laver, 1975).

The greeting behaviors of children and adolescents with autism have received little attention beyond noting that persons with autism rarely greet others (Rutter & Schopler, in press) or do so in very idiosyncratic ways which may not be recognized by others as greetings (Ricks & Wing, 1975). Parents of children with autism support these

findings (Park, 1982). However, there are few direct studies of the specific greeting behaviors and strategies which are used appropriately or inappropriately. Although greeting seems to be one of the most commonly taught behaviors in social skills programs (e.g., Mesibov, 1984), much is yet to be learned about the acquisition and use of greeting behaviors by both autistic and normally-developing children before implementing intervention programs. For example, one would not teach preschoolers with handicaps formal greeting behaviors if such strategies are rarely used by normally-developing children (Corsaro, 1979; Keane & Conger, 1981).

Study II sought to describe the behavioral topography of the greeting behaviors used by children and adolescents with autism and compare them to behaviorally-disordered and normally-developing children and adolescents. The target of the greeting was a familiar adult. Clinical experience and the observations of others (Howlin, in press; Lord, 1984) have shown that persons with autism may find it easier to relate to adults as opposed to their peers. Using a familiar adult as the recipient of the greeting behavior might increase the motivation to initiate contact.

An environmental press for greeting was provided through implicit situational cues. The adult followed a sequence of behaviors designed to maximize the probability of the children initiating the greetings. For example, Laver (1975) reported a strong tendency for the exchange of greetings to be initiated by the approaching person when the other was stationary. Thus, the adult was seated at a table when the subject approached. Another situational cue was the fact that it was the first

time that day that the child and adult had seen each other.

Study II focused on three aspects of greetings. The first was the length of time before the subject greeted the adult. It was hypothesized that children and adolescents with autism would require more time and more cues before greeting an adult than would behaviorally-disordered and normally-developing children. Autistic adolescents would greet the adult more readily than younger children with autism due to a greater probablity of having participated in social skills training.

The second emphasis was on the discrete behaviors used to greet the adult. It was predicted that persons with autism would look at the adult less frequently than would children in the other diagnostic groups (Tiegerman & Primavera, 1984). They were also expected to smile less frequently as part of their greetings than other children (Langdell, 1981).

The third emphasis was on the use of coordinated behaviors. Children and adolescents with autism were expected to use fewer coordinated sequences of behavior than those in other groups. Differences in the coordination of behaviors were predicted even when differences in individual behaviors such as talking and eye contact were not evident.

Methods and Procedures

The sample consisted of 11 children with autism, 10 children with behavior disorders, and 9 normally-developing children. The general context and sample were the same for study I and II. Descriptive

information about both can be found in study I.

Procedures

As part of the daycamp program, children were assigned to one of two teams each led by a female adult counsellor. Each team spent part of the day with their leader in a classroom assigned to their team. Observations for the greetings study took place in the team rooms at the beginning of the second and fifth day of the program. The leaders served as the adult confederates for the children on their team.

As the children arrived for daycamp, they were met in a large playroom/small gym down the hall from the team rooms. The subjects were then sent to the respective team room one at a time in random order. The only restriction was that no more than two children from a given diagnostic group were sent consecutively. The team leader and observer did not know the order of the subjects in advance. After the greeting occurred, the team leader talked to the child either about their team T-shirts (day 2) or what they had enjoyed about daycamp (day 5). The children then returned to the playroom/gym.

Two different instructions were given to elicit greetings. The order of these instructions was counterbalanced across age and diagnostic groups over the two observations. The instructions were (a) "Go see (team leader's name). She's in your team room." and (b) "Go say hi to (team leader's name). She's in your team room."

The team leader sat at a table positioned so that the subject, after opening the door, had to pass within one metre of her in order to enter the room. A videocamera (Sony 1640, 1610) was positioned to

record the child entering the room. The camera was somewhat camouflaged and was manually operated by an assistant during the daycamp for the youngest group. An observer was positioned as inconspicuously as possible to one side of the doorway.

A staff member was positioned near the team rooms and warned the confederate of an approaching child by knocking on the door. When the child opened the door, the team leader went through a sequence of behaviors (described below) until the child produced a verbal or gestural (e.g., waving) greeting. Only five gestures were observed and all occurred in association with verbal greetings. The observer coded the behavior, recorded verbatim what the child said, and using a stopwatch, recorded the time from the child's entry into the room until the greeting occurred.

Once the sequence was complete and the child left the room, the team leader and observer independently recorded the stage of the leader's sequence of behavior during which the child greeted the leader. Observers alternated between the two team leaders so that each observer recorded only one session per child. The team leader recorded both sessions. Agreement between team leaders and observers was 100%.

Following the taping of all subjects on a given day, observers reviewed the videotapes and coded the children's behavior in sequence. On-line codings were used to supplement the videotapes when the child moved out of camera range or when changes in direction of gaze were not visible on the videotape. Two observers independently rated randomly selected children from the videotapes as a reliability check and discussed any behaviors which were not clearly visible. Agreement

between observers was calculated using point-by-point agreement. For children who greeted the leader in stages 1 through 4, agreement for occurrence and sequence of behaviors was 100%; for children who reached stage 5, it was 87%.

One boy with a behavior disorder who was unable to attend daycamp was observed greeting a daycamp leader (who also led the evening group) during a weekly evening program in a setting similar to the daycamp. The first observation was done on the third evening of his attendance and the second observation was two weeks later. Each of the daycamp observers recorded one session.

Measures

Two sets of measures were designed for observing greetings. One measure reflected the behavior required from the adult confederate to elicit a greeting from the child. The other described the child's behavior before and during the greeting.

A standard sequence of behaviors was used by the confederates to provide situational cues and allow observation of each child's greeting. The sequence was based on the literature describing typical behaviors in adult greetings (Knapp, 1978a; Laver, 1975). It ranged from nonintrusive (e.g., the adult stared into space as the child entered the room) to very intrusive (e.g., the adult approached the child, smiled and said hello to the child). The sequence allowed observation of each child's greetings, beginning with initial attempts to make an initiation by getting the confederate's attention and spontaneously greeting her (Stage 1). If the child did not do so

within three seconds of entering the room, the confederate looked directly at the child with a neutral expression for three seconds (Stage 2). If this failed to elicit a greeting, the next stage consisted of the confederate looking at the child and smiling broadly for ten seconds (Stage 3). If no greeting occurred, the confederate, still looking at the child, said "Hi (child's name)" and continued to smile for three more seconds (Stage 4). The final stage (Stage 5) consisted of the confederate moving to face the child and then repeating the verbal greeting and smiling. Stages 1 and 2 were considered to be an initiation by the child, while in stages 3, 4, and 5 the child was considered to be responding to the confederate's greeting. Adult confederates and observers practiced the procedure with handicapped preschool children. The sequence was timed and confederates devised ways of staying within one second of the proposed timings.

In addition to recording the stage which the confederate reached before the child's verbal greeting, measures of the child's behavior were also derived. Using the same codes and methods described at length in study I, six behaviors were recorded: direction of gaze, vocalizations, smiling, gesture, whole body movements or approaches, and object use such as showing an item of clothing (see Table II-1 for definitions). The child's behavior was coded as it related to the confederate's progression through the sequence. Behaviors were coded up to and including the child's verbal greeting. All of the children eventually greeted their leader although in some cases repeated approaches by the confederate were necessary.

Table II-1

Behavioral Definitions

LL= looks at the leader. Can include any part of the body. (if looks at own body, code as LA; if relevant to interaction code as LO).

LO= looks at the object being used If looks at object not directly involved in current interaction code as LA.

LA= looks away from leader; target's nose and eyes pointed away, unfocused looking, or looks at observer.

LB= rapidly alternating eye movements, looks at leader, looks away, blinking.

S = smiles or laughs, upturned corners of mouth, (does not include mannerisms such as repeated grimacing).

T = talks, vocalizes, sings, grunts.

A = approaches, moves in the direction of leader, leans toward leader (does not include rocking or repetitive mvts.).

G = gesture- points, nods, shakes head, reaches for. Contributes to communication (does not include flapping or finger flicking).

O = object use (e.g., showing shirt, offering consent form).

As an example of the procedure, consider a boy who entered the room and looked directly at the confederate who was staring off in space. He said and did nothing besides look and so was coded LL in Stage 1. The child then looked away from the leader and walked into the room (coded as LA-A, Stage 1). The confederate then shifted her gaze to the child. At this point, the child shrugged his shoulders. looked at the leader and said "Hi, Jan. Look at my T-shirt" (coded as LL-T-G, Stage 2). There was no attempt to order behaviors such as looking, talking, and gesturing within a step.

Results

A two-way (age by diagnosis) MANOVA with four dependent variables and both conditions ("hi" and "no instruction") combined revealed no significant main effects or an interaction effect. The variance was homogeneous for all variables with the exception of latency of initiation as measured by Cochrans C. Results of the univariate analyses are reported below as they relate to each facet of greeting behavior. All posthoc comparisons were done using a Scheffe procedure unless otherwise specified. One chi square analysis was performed for each dependent variable and significant chi square results are reported in the following sections.

I. Latency of greeting

It was predicted that the latency to greet a familiar adult would be longer for autistic children than for children in other diagnostic groups. Age effects were also expected within the group with autism.

These hypotheses were not supported: diagnosis, F (2, 24)=2.38, p=.11; age group, F (1, 24)=.06, p=.81. Children with autism took longer to greet the adult (M=15.6 seconds, SD=6.56, range 2-29) than did adolescents with autism (M=8.8 sec., SD=6.43, range 3-20). The group with autism required longer (M=11.9 sec., SD=9.91) than the behaviorally-disordered (M=6.1 sec., SD=4.11, range 2-13) and the normally-developing (M=4.6 sec., SD=3.48, range 2-11) groups. The variance was not homogeneous (Cochrans C=0.57, p=.029).

Children with autism were expected to require more environmental cues before greeting than were children in other groups. This hypothesis was supported: "no instruction" condition, $X^2(2, N=30)=5.81$, $p<.06$; "hi" condition, $X^2(2, N=30)= 7.01$, $p<.04$. In the latter condition, the number of children greeting the adult before she smiled at them (i.e., Stages 1 & 2) and the number responding after her smile or verbal initiation (i.e., Stages 3, 4, & 5) differed across diagnostic groups (see Table II-2). None of the normally-developing children reached the level in the sequence such that they were responding to the confederate's greeting while six children with autism and three children with behavior disorders reached that level.

II. Behavioral aspects of greetings

It was predicted that children with autism would not look at the person they were greeting as often as would children from the other diagnostic groups. The number of times the subject looked at the adult upon entry to the room and upon actually greeting the adult was used as the dependent variable. The univariate analyses revealed no

Table II-2

Number of Subjects Reaching Each Stage Before Greeting ("Hi" condition)

	Autistics	Controls	Normals
Stages 1 & 2	5	7	9
Stages 3,4,5	6	3	0

Stage 1: no eye contact
Stage 2: eye contact
Stage 3: eye contact & smile
Stage 4: eye contact, smile, & verbal greeting
Stage 5: eye contact, smile, verbal greeting, & approach

significant differences between diagnostic [F (2,24)=.88, p=.42] or age [F(1,24)=1.01, p=.32] groups.

Because there was a surprising amount of looking away from the adult during the process of greeting (almost as much as looking at the adult), a posthoc analysis was done to determine what else the children were doing while they were looking away. Looking away briefly while approaching is a normal behavioral combination in greetings (Knapp, 1978a). Interestingly, children with autism were significantly less likely to be approaching the target person while looking away (M=10.0%, SD=14.1) than were the normally-developing (M= 45.9%, SD=39.6) and behaviorally-disordered (M=49.9, SD=37.3) children, F(2,20)=3.61, p=.045. Rather, autistic children more often did nothing else while looking away (M=66.0%, SD=23.1) as compared to normally-developing (M=33.3, SD=28.2) and behaviorally-disordered (M=35.7, SD=39) children, F(2,20)= 2.82, p=.08. They did not look away and talk significantly more often than did other children.

Children and adolescents with autism were also expected to smile less often than other children when greeting a familiar adult. There were no differences between age groups, F(1,24)=0.24, p=.63 but there were differences between diagnostic groups, F (2,24)=3.14, p=.06. During the actual verbal greeting the group with autism smiled significantly ($p<.05$) less often (M=0.27, SD=0.65) than the behaviorally-disordered group (M=1.0, SD=.71) and less often than the normally-developing group (M= 0.75, SD=.67). It must be remembered when looking at the results that only two of the normally-developing children ever reached the stage in the confederate's sequence of

behavior where she was smiling at them. Six of the 11 autistic children consistently reached this stage.

The chi square analysis was significant, $X^2(2,N=30)=8.96$, $p<.02$. As evident in Table II-3, only two children with autism (one younger, one older) smiled at least once during the greeting compared to eight children with behavior disorders and six normally-developing children.

III.Coordinated behaviors

It was also predicted that children with autism would use fewer coordinated behaviors to greet a familiar adult than would children in other diagnostic groups. A coordinated behavior was defined as looking plus at least two other behaviors (Mueller & Brenner, 1977). There were differences between groups on the number of coordinated behaviors used during the verbal greeting, F $(2,24)=3.78$, $p=.038$. The group with autism used significantly ($p<.05$) fewer coordinated behaviors ($M=0.81$, $SD=0.75$) than did both the behaviorally-disordered ($M=1.5$, $SD=0.53$) and normally-developing ($M=1.44$, $SD=0.53$) group as measured using a Student-Newman-Keuls test. The chi square analysis was also significant, $X^2(2,N=30)=7.97$, $p<.02$. Four children with autism (three younger and one older) never used coordinated behaviors as part of their greeting while all other children showed at least one instance (see Table II-4).

There appeared to be age differences, $F(1,24)=3.66$, $p=.068$. Younger children used an average of one instance of coordinated behavior ($SD=0.63$) while older children averaged 1.47 ($SD=0.61$).

Table II-3

Number of Subjects Smiling During the Greeting

	Autistics	B. D.*	Normals
Smiled at least once	2	8	6
Never smiled	9	2	3

* B. D.= behaviorally-disordered

Table II-4

Number of Subjects Using Coordinated Behaviors to Greet

	Autistics	B. D.*	Normals
Used at least one coordinated behavior	7	10	9
No use of coordinated behaviors	4	0	0

* B. D.= behaviorally-disordered

Discussion

Many of the high-functioning children with autism who participated in the study did not greet adults as readily as did either behaviorally-disordered or normally-developing children. In over half the cases, children with autism did not initiate contact within a reasonable length of time (see study III) but instead responded to overtures (such as smiling and talking) by the adult confederate. The expectations in half of the trials were made explicit (i.e., child was told to go say "Hi") so that there was no question of the situation not being understood by the child. The use of a familiar adult and the timing of the observations were all designed to facilitate the greeting behavior. Also, many of the children had probably been taught appropriate greeting behavior by their parents or teachers. Yet use of the behaviors in appropriate situations remained problematic for at least some of these children. For those who greeted the adult, there were certain qualitative differences in their greetings for which measures were not available but which distinguished them from other children. This finding of failure to greet others and qualitative differences supported anecdotal reports in the literature. What remains unclear are the reasons for the differences.

In addition to the delay in greeting, there were differences in the behaviors used and the manner in which behaviors were combined as part of the greeting process. Children and adolescents with autism did not consistently use smiles as part of their greeting even though over half of them greeted an adult who was smiling. This finding, while not unexpected, points to the possibility of a deficit in the process of

exchanging social smiles. Thus, the problem may be the coordination of one's own behavior with another's behavior. Mutual smiling was also examined in study III.

Autistic children used fewer coordinated behaviors than did children in other diagnostic groups. The deficits of children with autism may not lie solely with discrete behaviors but also with their ability to combine behaviors. Although this finding differed from study I, the design of the present study handled the problem of attributing intent to actions without placing constraints on the coding system as was done in study I. Thus, the present design facilitated detection of differences in the use of coordinated behaviors. The choice of greetings as the social situation also served to highlight this deficit. While other social situations may require fewer coordinated behaviors, greetings demand an ability to perform several behaviors simultaneously while coordinating those behaviors with the behavior of another.

In addition to a difficulty in the coordination of discrete behaviors, it is possible that persons with autism may use combinations of behaviors differently. The finding that children with autism tended not to combine looking away with moving toward the target indicates some yet to be defined abnormality in this area. Thus, it is important to look not only at the presence or absence of coordinated behaviors but also at the kinds of coordinated behaviors used and the specific situations in which they are used.

The failure to find differences in the number of times that children with autism looked at the person whom they were greeting

replicates the results of study I. The possible reasons for this finding have been addressed in study I and study III sought to overcome the limitations of the coding system used in the present study. Additionally, there may have been differences in the duration rather than the frequency of the looking behaviors. Duration was not measured directly.

The study of greetings is by no means straightforward. It is not clear how factors such as the relative status of the interactants (one being the leader and the other a group member) may have influenced the results (Laver, 1975). One way to determine the impact of this factor is to replicate the study and vary the interactants so that they are of equal status. This was done in study III.

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STUDY III

Maintaining and Terminating Interactions with Peers

An interaction does not occur until there has been some exchange of signals following the initial overture by one of the interactants (Greenwood, Walker, Todd, & Hops, 1981). One needs to acknowledge the existence of the other either verbally or nonverbally. Following this initial response, there must be a coordinated reciprocal pattern of interchange if the interaction is to be more than a brief, transient contact (Dawson & Galpert, 1986; Odom & Strain, 1986). An ability to take turns is essential to the success of an interaction. This ability is termed "responding" and is the second component in Knox's (1985) three component model of interaction.

Once involved in a social interaction, one must be able to bring that interaction to a satisfactory close. The behaviors used must convey definite closure while solidifying the relationship established during the interaction and leaving open the possibility of future contacts (Laver, 1975; O'Leary & Gallois, 1985). This ability is the third component of Knox's (1985) model and is called "terminating".

The previous two studies did not describe the responding and terminating aspects of an autistic child's interaction. Study I indicated that younger autistic children engaged in interactions which were relatively brief. What remained unclear were the reasons for the brevity of the contact, who brought the interaction to a close, and how the contact was broken. For those interactions which did last for a longer period of time, it was not clear whether both interactants

contributed equally to sustaining the interaction or if one person was primarily responsible. Thus, this third study focused on how autistic children sustained an interaction beyond the simple initiation-response sequence and how they in turn terminated that interaction.

Behaviors maintaining an interaction: Normal development.

Sustaining a social contact requires skillful behavior by both of the interactants (Strain, 1983). Skills such as provision of feedback, development of mutual attention (Keane & Conger, 1981), turn-taking, mutuality, synchronization, reciprocity, and responsiveness (Dawson & Galpert, 1986; Hobson, 1983; Odom & Strain, 1986) all contribute to the maintenance of an interaction. The nonverbal and verbal components of these skills work together to allow smooth, coordinated interactions.

In general, nonverbal behaviors contribute to interaction maintenance by regulating the flow of communication (Knapp, 1978) and signaling "moment-to-moment" responsiveness (Wiemann & Harrison, 1983). Nonverbal behaviors regulate speaking and listening turns by signalling the end of speaking or indicating a desire to begin. They also provide feedback about interest and attention.

Gaze, smiling, and gesturing are three nonlanguage behaviors which facilitate interactions. Eye-to-face gaze is an integral part of the communicative process (Slee, 1984) serving not only as a channel but as a signal (Argyle & Cook, 1976) which indicates interest and attentiveness (Argyle & Cook, 1976), regulates turn-taking, and provides feedback (Duncan, 1983; Mirenda, Donnellan, & Yoder, 1983). Smiling is also a feedback channel for interactions. Interactants tend

to return smiles (Argyle & Cook, 1976) and unreciprocated smiles are of short duration (Duncan, 1983). Smiling signals support, affiliation (O'Leary & Gallois, 1985), responsiveness, and attention. Gestures such as nodding also serve the purpose of indicating attentiveness and interest.

Language skills are a major contributor in sustaining interactions (Eisenberg & Harris, 1984; Holmberg, 1980). Children use language to regulate and be regulated by others (Layton & Stutts, 1985); to establish a frame of reference for play activities; to direct attention to an object, event, or one's self (Prizant & Wetherby, 1985); and to express interest.

The ability to combine the single behaviors discussed above into coordinated units helps to maintain the interaction, particularly when the goal of the interaction is sharing an experience (Mundy, Sigman, Ungerer, & Sherman, in press). In object-centred interchanges which are common in childhood, the child must be able to interact with the object and the other child simultaneously. Such interchanges require "triadic attentional deployment" in order to sustain the interaction (Mundy et al., in press).

Maintenance behaviors in autistic children.

While Brownell (1986) reported that children 24 months of age have acquired many of the skills listed above and were able to participate in reciprocal social interactions, autistic children appear to have marked delays in acquiring these skills. In fact, impaired reciprocity and responsiveness remain characteristic of persons with autism

throughout their lives despite gains in other areas of functioning (Hobson, 1983; Schopler & Mesibov, 1985). While the need for intervention is recognized, it is not clear exactly what skills need to be taught in order to improve their functioning (Mesibov, 1983).

One nonlanguage area which may need intervention is gaze. Eye-to-face gaze is used in abnormal ways (Bartak & Rutter, 1976; Mirenda, Donnellan, & Yoder, 1983) although the exact nature and cause of the abnormality is unclear (Dawson & Galpert, 1986). Study I and II did not detect significant differences in gaze during initiations but this third study reexamines this area for reasons discussed earlier.

Another nonlanguage area is smiling. A study of two 16-week old twin boys revealed that the twin who was later diagnosed as having autism did not smile in response to his mother's smiles or her attempts to make him smile whereas the normally-developing twin did smile (Kubicek, 1980). A study of home movies of children with autism showed that some of them smiled in the first six months (e.g., case 1,2) and others did not smile (e.g.,case 5,8) (Massie & Rosenthal, 1984). On the other hand, the mean duration of autistic preschoolers' smiles did not differ from that of mentally handicapped or normally-developing preschoolers although no information on frequency was reported (Sigman, Mundy, Sherman, & Ungerer, in press). Older autistic children smile infrequently and their smiles may be mistaken for grimaces, especially when they are not spontaneous (Langdell, 1981). The greetings study (study II) found a lower rate of smiling by autistic children even when the person with whom they were interacting was smiling at them. To summarize, some children with autism show delays in smiling although

they do acquire the behavior. However, smiling is relatively infrequent, is done in such a way that it may not result in a smile from others, and may not be seen in response to others' smiles. Not only is it important to record the occurrence of smiles but also their timing.

Turning to verbal areas, abnormalities in both receptive and expressive language skills have a considerable impact on the ability of persons with autism to sustain interactions with peers (Lord & Garfin, 1986). The receptive deficits of persons with autism limit their ability to comprehend the goal of an interaction, to follow the sequence of a conversation, and to respond appropriately. Similarly, autistic children's odd patterns of expression and the content of their conversations may result in a failure to maintain an interaction. A stereotyped or rigid pattern of interests, one of the diagnostic criteria for autism (Rutter & Schopler, in press), may result in behaviors such as talking at great lengths about particular rock groups or sports teams irrespective of the other person's lack of interest in the topic. Such behavior prevents mutuality and reciprocity in the interaction.

Autistic children also have some difficulties in the area of behavior coordination particularly when the goal of the interaction is to share interest. Mundy and associates (in press) found no differences between autistic, mentally handicapped, and normally-developing 3 to 6 year old children in their ability to make eye contact and gesture. However, they were significantly different in their ability to coordinate their attention between a toy and an adult.

Based on the available literature, the following predictions were made regarding the maintenance of interactions by children and adolescents with autism: (a) interactions between autistic children and their normally-developing peers would be of shorter duration than those of behaviorally-disordered and normally-developing children and their normally-developing peers (a replication of study I results), (b) autistic children would look at the other person less frequently and look away or at the other person's body more often than would children in other diagnostic groups, (c) autistic children would not smile as frequently as children in other diagnostic groups (a replication of study II results with peers instead of adults), (d) younger autistic children would talk less frequently than other children while older autistic children would talk as frequently as their normally-developing peers but their talk would not be associated with longer interactions, and (e) autistic children, regardless of age, would use fewer coordinated behaviors to sustain the interaction than other children.

Behaviors terminating an interaction: Normal development.

Research by various authors (see O'Leary & Gallois, 1985) has suggested that there are established behavior patterns which serve to terminate an interaction while solidifying the relationship and leaving open the possibility of future contacts (Laver, 1975). Both verbal and nonverbal behaviors are used to bring the interaction to a mutually satisfactory close.

One nonverbal behavior used in terminations is gaze. Young infants use gaze aversion as a means of terminating an interaction

(Kubicek, 1980; Tiegerman & Primavera, 1984). In adult interactions, a prolongation of eye contact seems to be used to signal the beginning of the termination (Laver, 1975) and breaking eye contact signals the actual end of the interaction (Laver, 1975; O'Leary & Gallois, 1985).

Smiling is also utilized in terminating an interaction. It may affirm the relationship, serving the same function as verbal continuity statements. Kubicek's (1980) study of a 16 week old normally-developing child found that he slightly closed his eyes and allowed his smile to remain or fade before looking or turning away from his mother during an interaction. In a study of adults, mutual smiling consistently occurred before other behaviors in the termination sequence (O'Leary & Gallois, 1985).

Verbal behaviors play a key role in ending interactions. O'Leary and Gallois (1985) identified two phases of verbal behavior associated with terminations by adults. The first brought the conversation (a topic had been assigned) to a close and included use of information and summary statements with some verbalizations. The second phase ended the interaction with justification, continuity, and well-wishing statments. In contrast, normally-developing preschoolers observed in a play area seldom used any formal leave-taking ritual (Corsaro, 1979, 1981), making no comment or remark about the departure in 80% of the withdrawals.

Terminating behaviors of autistic children.

The behavioral aspects of terminations by children with autism have received little attention. Autistic children display gaze

aversion (Kubicek, 1980; Tiegerman & Primavera, 1984) although the function of this behavior and its relationship to terminating interactions is not clear. Preschoolers with autism have also been found to walk away from various kinds of play interactions with their caregivers more frequently than normally-developing and mentally handicapped preschoooolers (Sigman et al., in press). Little direct information is available about verbal components of autistic children's terminations.

Lord and Hopkins (1986) reported that it was rare for the school-aged autistic children in their study to respond in a manner which continued an interaction with their normally-developing partner beyond an initiation-response sequence. As most normally-developing children this age use elaborated interchanges (Holmberg, 1980), the problem may lie with the autistic children and their responses. Such an assumption raises the issue of determining how an interaction ends. Does it end because the autistic child fails to respond to a communication signal sent by the partner or vice versa? Or does it end because the autistic child's response is so odd or so uninformative that it provides no basis for continued interaction?

Based on the literature and clinical experience, autistic children were expected to terminate interactions differently than behaviorally-disordered and normally-developing children. It was predicted that (a) autistic children would not use termination strategies such as beginning a new interaction with another child, (b) they would fail to respond to the last signal sent by their partner more frequently than other children, and (c) they would display a

particularly low rate of mutual smiling and thus, fail to lay the basis for future contacts.

Replication of selected aspects of study II

One question left unanswered earlier was that of what children would do upon encountering a familiar peer (in contrast to an adult in study II) when the requirement to initiate contact was explicit. As the behavioral topography of greetings to peers has not been reported elsewhere, those aspects of the previous study which were easily incorporated into the current study were repeated with some minor alterations (see methods section). Earlier findings to be replicated were (a) autistic children take longer to initiate an interaction with a peer than behaviorally-disordered and normally-developing children when there are both explicit and implicit forces to facilitate that initiation, (b) autistic children smile less during the initiation of interactions than do children from other diagnostic groups, and (c) autistic children use fewer coordinated behaviors during the initiations than do other children.

Methods and Procedures

General context

This study took place in conjunction with an ongoing program of social groups based in the same school hospital used in studies I and II. The program is held one night per week for one to one and a half hours. The autistic and behaviorally-disordered children and their normally-developing partners are grouped according to age and attend

for four to five consecutive weeks. For purposes of this research, five sleepovers and one 4 hour afternoon group were arranged for children attending the evening program. The four hour afternoon group was necessary as some of the children were too young to be away from home overnight. The goal was to create a block of time in which to observe the children in the physically and socially familiar setting of their evening groups.

The sleepovers were held in the same 8 X 12 metre room used for the evening program and described in study I. Two rooms adjacent to the area and equipped with one way mirrors at one end were used for the study as they allowed unobtrusive observer coding. The sleepovers were scheduled on two Friday evenings during the school year and mid-week during the summer vacation. The children arrived at 4:30 in the afternoon and went home at 10:00 the following morning.

Subjects and confederates

Of the 11 autistic and 10 behaviorally-disordered children who participated in this study, ten autistic and six behaviorally-disordered children had participated in studies I and II. The autistic children were once again matched on the basis of language skills (to control for the use of language in sustaining interactions), chronological age, and gender to behaviorally-disordered children known to have problems with social relationships (see Table III-1).

Once autistic and behaviorally-disordered children had been selected, 57 normally-developing children who had previously attended the evening groups as community volunteers were recruited. Of these,

Table III-1

Age, Sex, and Intelligence Scores of the Three Diagnostic Groups[a]

	Younger Autistics	Younger B. D.*	Younger Normals	Older Autistics	Older B. D.	Older Normals
Total no.	6	6	6	5	4	5
-girls	2	2	2	2	2	2
-boys	4	4	4	3	2	3
Age range	6.8 to 13.0	7.1 to 12.8	4.9 to 9.6	14.5 to 20.2	13.2 to 16.0	13.5 to 14.3
M CA	9.74 (2.13)	9.60 (2.02)	7.54 (1.61)	16.33 (2.01)	14.71 (1.02)	13.88 (0.48)
M Verbal IQ	85.33 (11.43)	83.83 (16.02)		92.00 (15.84)	96.25 (15.43)	
M Verbal MA	8.44 (2.70)	8.01 (2.39)		14.79 (1.28)	14.10 (1.35)	
M Perf. IQ	95.83 (18.79)	85.83 (9.70)		87.60 (16.35)	98.75 (20.70)	

Age of Confederates

	Younger		Older	
	C1	C2	C1	C2
Total no.	15	12	11	8
-girls	5	4	4	2
-boys	10	8	7	6
M CA	8.41 (3.5)	9.61 (4.6)	14.38 (1.7)	14.28 (1.6)

a - all standard deviations are in brackets

* - B. D.= behaviorally-disordered children

the eleven who matched the autistic children most closely in gender and language abilities served as the normally-developing control group. These children were younger than children in the other diagnostic groups (see Table III-1). All autistic, behaviorally-disordered, and normally-developing target children participated in both conditions of the study. Of the other 46 normally-developing children recruited for the study, 26 participated as confederates in condition 1 (no protocol) and 20 participated in condition 2 (protocol).

Measures

The on-line observational codes were similar to those used in the previous two studies. From the time the child entered the room, direction of gaze, vocalizations, smiling, whole body movements, gestures, and use of objects were recorded by observers. Direction of gaze included eye-to-face gaze (a category not used in previous studies), looking at the recipient's body, looking away from the recipient including looking at others in the room, and looking at objects. Behavioral definitions are described in Table III-2. While movements, object use, and gestures were recorded these behaviors were only used to determine the complexity of coordinated behaviors. In total, only three to five gestures per diagnostic group were observed during initiations and the first 30 seconds of interaction.

Individual entries were made each time any of the target behaviors changed. After the initiation had occurred, behaviors were entered on data sheets divided into 24 five second segments. Changes of behavior within the interval were noted. A prerecorded audiotape which gave a

Table III-2

Behavioral Definitions

LF= looks at child's face; target's nose and eyes are directed towards the other child's face (if unclear, code as LB).
(if clearly looking at other's face out of corner of eye, code LF)

LB= looks at any part of other child's body other than the face.
(if looks at own body, code as LA; if relevant to interaction code as LO)

LO= looks at the object being used or at another child's object
If looks at object not directly involved in current interaction code as LA.

LA= looks away from other child; target's nose and eyes pointed away, unfocused looking, or looks at another child not involved in the interaction

S = smiles or laughs, upturned corners of mouth
(does not include mannerisms such as repeated grimacing)

T = talks, vocalizes, sings, grunts

M = moves away from child with whom interacting, increases the distance between interactants. Includes leaning back.

A = approaches, moves in the direction of other person, leans toward other person (does not include rocking or repetitive mvts.)

G = gesture- points, nods, shakes head, reaches for. Contributes to communication (does not include flapping or finger flicking)

O = object use or offer of objects.

Noninteraction= 20 seconds in which there is no exchange of verbal, non-verbal, or physical signals. If one child repeatedly initiates but there is no response i.e., no gaze, no mutual object use, then code as noninteraction.

Interaction= exchange of signals- mutual gaze, interaction with toys (e.g., running a truck into another child's vehicle), talking (directed to another child as measured by content or by gaze).

Termination= the last behavior before 20 seconds of noninteraction.

number every five seconds was used for timing. In this way while each observer was recording a different child, it was possible to determine what each child was doing during the same five second interval.

Interactions were recorded using two videocameras (a Panasonic AG-100 and a Sony 1640). As part of on-line coding, coders attempted to identify 20 second breaks, the behaviors used immediately before the period of non-interaction, and the person ending the interaction. However, it was difficult to anticipate and identify a termination. Videotapes were used to confirm (a) that the period of noninteraction was indeed 20 seconds with no prior undetected break in interaction, (b) the behaviors used to terminate an interaction, (c) the length of the interaction, and (d) what the child said.

Prior to commencement of the study, four observers (two medical students, one graduate and one undergraduate student) who were not familiar with autistic children or the hypotheses under investigation coded videotapes of children from previous studies. Once observers were over 90% reliable using point-by-point agreement for occurrences, sessions were held during the evening program to allow on-line coding practice and to test the procedures. Additionally, two teenage girls and one male who were not participating in the study were observed while simulating various situations which could arise during the actual study. When the observers were over 90% reliable for three trials, the data collection began.

Procedures

Parents of all children involved in the evening program were

informed of the research aspects of the program (see Appendix A). Only children with parental consent participated in the study (there were no refusals). Parents were able to observe the program and could remove their child at any time.

The study had two conditions which autistic, behaviorally-disordered, and normally-developing subjects experienced in counterbalanced order. The order in which the children were sent to a particular room was random with the constraint that no more than two children from the same diagnostic group followed each other. In both conditions, the subject was told that as part of the preparation for supper (or snack for the afternoon group) they were to spend five minutes in the room helping prepare pizzas (or sundaes). The children were also told that they could leave the room when they were finished or when they heard a knock on the door. A five minute duration was chosen because O'Leary and Gallois' (1985) reported that conversations between friends on assigned topics averaged 5 minutes and 12 seconds. However, this study of maintenance behaviors focused on the first 30 seconds of interaction. In study I, it appeared that many of the interactions of autistic children failed in the first 30 seconds.

The activities in each condition were identical and consisted of preparing a pizza (or sundae). In each room there were two confederates, located at separate tables with a vacant chair at each table. On the table were different materials which allowed two persons to participate in the same activity. For example, if the activity was cutting up ham then there were two cutting boards with chunks of ham and two knives on one table. On the other table there might be spoons

and two containers of sauce to spread on the pizza dough. Thus, the child entering the room had a choice of two persons with whom to interact and two slightly different activities. Pizza and sundae preparations were chosen as activities because they (a) are enjoyed by a wide variety of age groups, (b) are easily broken down into a series of short steps which contribute to the finished product yet allow breaks to occur naturally, and (c) are motivating in that the food can be sampled as it is cut.

Confederates in both conditions were taken to the rooms prior to the subject's entry and positioned as far apart as the cameras and rooms would allow (approx. 6 to 10 feet). In each room there were two confederates of the same gender as the subject. At least one of the confederates was familiar to the subject (had been in at least one evening program with him or her).

Instructions to confederates differed according to the condition. In condition 1 (no protocol), confederates were told that it was their turn to help prepare pizzas and that they were to remain seated at their tables, working on their job (e.g., cutting ham into tiny pieces, slicing pineapple). They were informed that someone would come in to help one of them. If no one came to their table to help, they were to return to the play area until it was their turn again. This latter instruction was necessary in order to minimize interaction between the subject and more than one confederate. Confederates in condition 1 never received more than three initiations (average 1.4) and did not remain in the room for more than two consecutive target children.

In condition 2 (protocol), confederates followed a simplified

version of the protocol used by adult confederates in study II. This protocol was based on a progression of normal greeting behaviors with preset latencies and order of behavior. Confederates were told that we were observing what children did when they came into a room and saw someone they knew. When they heard the door open, they counted to 3 silently before looking, without smiling, at the target child entering the room. They then counted to 3 silently and smiled at the child. Unlike Study II, they were instructed to talk to the target child only after he or she talked to them. The confederates in condition 2 practiced the protocol until they performed it accurately (within one second) for two consecutive practice trials with the experimenter. The number of trials required for training varied with the age of the children. Reminders about the protocol were given in the break before each subject's entry as the next activity was set up.

Confederates were also told that if no one came to their table they were to leave the room. Confederates participated in condition 2 only until they had received three initiations. At that point they were thanked for their assistance in the project and asked not to discuss the procedures with other children. The confederates averaged 1.7 initiations with most receiving only one.

Two observers were positioned in each observation room and both recorded the target child's behavior from the time she or he entered the room until she or he approached another child. At that point one observer coded the initiating child while the other coded the recipient's behavior. When observers thought an interaction had terminated, timing of the period of non-interaction began using the

number of five second intervals with no interaction. When 20 seconds had elapsed, observers ceased recording the behaviors, noted the terminating behavior, and circled any behaviors to be checked on the videotape later. Observers alternated following the initiating child and the respondent. Pairs of observers were assigned such that no pair observed all condition 1 or 2 sessions. Reliability was calculated after each sleepover and training sessions were held between sleepovers to maintain reliabilities.

Interrater reliability was calculated using point-by-point agreement for occurrence of behaviors. An agreement during continuous coding meant that raters recorded the same behaviors in the same step. For those observations where the behavior was entered in five second segments, the identical behaviors had to fall in the same interval and in the same step to be considered an agreement. Because this study focused on initiations and the following 30 seconds due to the apparent importance of this period in ongoing interactions, there was a greater need for high reliabilities during this time.

Reliabilities for behaviors constituting initiations averaged 90.8%. For those initiations requiring less than 8 seconds, the reliability was 95.4%; for those over 8 seconds, 84.5%. The category of approach accounted for half of the disagreements with one observer including it with other behaviors and the other often failing to note it. This category was used only for the analysis of coordinated behavior in the initiations following resolution of disagreements using videotapes. Reliability for ongoing interaction was 89.0% for the first 30 seconds. For the next 30 seconds it was 79.7%.

Some methodological problems were encountered. Confederates often failed to follow instructions. For instance, all confederates were told to leave the room if no one came to their table to help them. In practice, many of them did not leave presumably because they preferred making pizzas to playing games. In condition 2, some confederates did not follow the protocol exactly when confronted with a peer instead of the experimenter. This was especially true for younger children who had difficulty waiting until they were spoken to by the target child. In four cases, confederates actually initiated to the child entering the room before the target child spoke. Despite these problems the timing of the confederates' initiations still differed in condition 1 and 2 (see below).

Another problem was that subjects did not leave the room in response to the knock on the door (thus terminating the interaction). As a result the experimenter often had to enter the room to terminate interactions which continued despite repeated knocks. Some children were very reluctant to leave before they had completely finished the task. Thus, too few subjects followed the protocol to allow analysis of what was said as the subjects terminated the interaction and left the room.

Results

As in the previous two studies, posthoc comparisons were analyzed using the Scheffe procedure and homogeneity of variance was measured using Cochrans' C. Multivariate analyses were not done due to a variable number of subjects from analysis to analysis. For example,

two of the autistic adolescents were not included in the analysis of initiation times because the confederates initiated to them in both conditions. This left only three persons in the category of older autistic making it difficult to treat them as a separate cell. A similar problem occurred for the analyses related to interaction maintenance. Subjects who did not have more than two intervals of interaction were excluded and again the number of subjects per cell was compromised.

The data were analyzed primarily using univariate ANOVAs although two-way (age by diagnosis) ANOVAs were performed whenever possible. A chi square analysis was conducted for each dependent variable. Results are reported in relationship to individual behaviors so that the relative use and meaning of each behavior across phases of interaction can be examined. Quantitative measures of interaction are presented first.

I. Duration

Autistic children were expected to have interactions of shorter duration than those of behaviorally-disordered or normally-developing children. The results of the two-way ANOVA for the total time each child spent interacting were: diagnosis- $F(2,26)=2.1$, $p=.14$; age- $F(1,26)=0.49$, $p=.49$; and the interaction $F(2,26)=2.67$, $p=.088$. A chi square analysis of the number of children interacting longer than 30 seconds revealed significant differences, $X^2(10, N=32)=19.0$, $p<.05$. Two older autistic and two younger behaviorally-disordered children interacted less than 30 seconds in both conditions. Only one autistic

child interacted longer than 30 seconds in both conditions as compared to seven out of ten behaviorally-disordered and seven out of eleven normally-developing children (see Table III-3). This result partially replicated results of study I.

In this study, if an interaction lasted 30 seconds then in 86% of the cases it continued for at least one minute; in 65.1% of the cases it lasted two minutes. For the normally-developing children the probability of a 30 second interaction lasting at least one minute was 100%; for the children with autism it was 90%. Thus, the first 30 seconds appears to be important to the duration of an interaction.

II. Time to initiate

Contrary to Laver's (1975) report that the person moving towards a stationary person initiates the greeting, in condition 1 (no protocol) there was a strong tendency for confederates (who were stationary) to greet the subject (who was moving). Sixty-nine percent of the confederates greeted the subject within four to five seconds of their entry to the room. Clearly, neither group had read Laver's study. Two of 11 autistic children, four of 10 behaviorally-disordered children, and four of 11 normally-developing children greeted confederates before confederates greeted them. Eighty-four percent of all greetings occurred within seven seconds of the target child's entry. Of the children who required longer than seven seconds to initiate, three were children with autism and two were children with behavior disorders. Thus, in a fairly naturalistic setting most greetings occurred within seven seconds and were initiated by the child

Table III-3

Number of Children With Interactions Lasting Longer Than 30 Seconds

	Autistics		B. D.*		Normals	
	Younger	Older	Younger	Older	Younger	Older
Two interactions over 30 sec.	1	0	4	3	4	3
One interaction over 30 sec.	5	3	0	1	2	2
No interactions over 30 sec.	0	2	2	0	0	0

* B. D.= behaviorally-disordered children

already in the room.

In condition 2, four confederates were unable to follow the protocol and, contrary to instructions, initiated to two autistic and two normally-developing children before the subjects spoke to them. However, confederates had waited an average of seven seconds before initiating. These dyads were not included in the latency analyses.

Children with autism were expected to take longer to initiate an interaction than were children from other diagnostic groups. This prediction was not supported [F (2,25)= 0.85. p=.44], although it must be noted that groups did not have homogeneous variance (Cochrans' C=.91, p=.00). Both the nonhomogeneity of variance and the failure to find differences in latencies replicated study II results.

Thus, as a group the autistic children were not significantly slower to initiate contact with other children when the demands of the situation were explicit. Particular autistic children were less likely to greet the confederate upon entry, and with some behaviorally-disordered children, were more likely to take longer than seven seconds to initiate a verbal greeting. Failure to find significant differences may be due in part to some of the normally-developing children's awareness of the experimental aspects of the situation and their attempts to determine what was expected of them rather than focusing on the interaction. More importantly, small sample sizes meant that variation within a diagnostic group obscured possibly significant differences between groups.

III. Smiling

In all aspects of an interaction (initiation, maintenance, and termination) it was predicted that children with autism would use smiles less often than would children in the other two diagnostic groups. This hypothesis was partially supported.

Analysis of the number of smiles in initiations or responses to initiations in both conditions revealed significant differences, $F(2,29)=3.38$, $p=.048$. Autistic children ($M=0.18$, $SD=0.40$) showed significantly ($p<.05$) fewer smiles than behaviorally-disordered children ($M=1.2$, $SD=0.39$) with normally-developing children ($M=0.72$, $SD=0.90$) between the two groups.

There were no significant differences between groups for the number of smiles during the maintenence phase, $F(2, 24)=2.06$, $p=.149$. However, the results reflected the pattern seen during initiations with autistic children smiling less ($M=0.78$, $SD=1.1$) than behaviorally-disordered children ($M=2.13$, $SD=1.4$) with normally-developing children ($M=1.40$, $SD=1.6$) in the middle. One normally-developing child and two children from each of the other diagnostic groups were not included in the analysis as they did not have 30 seconds of interaction.

Children with autism were expected to participate in fewer instances of mutual smiling. A mutual smile was defined as both the target and his or her partner smiling within the same three steps; an unreciprocated smile was a smile by either child without a smile by their partner within three steps. There were significant differences in the number of children who showed at least one instance of mutual smiling in association with either an initiation or termination in

either condition, $X^2(2, N=32)=7.11$, $p<.05$. One autistic child as opposed to five children from each of the other diagnostic groups exchanged smiles with their partners at least once (see Table III-4). One girl with a behavior disorder and two normally-developing girls showed more than one instance of mutual smiling. These findings provided support for study II's results relating to smiling.

IV. Gaze

Differences between diagnostic groups in the use of gaze were predicted only in the maintenance phase of an interaction. This hypothesis was not supported. There were no significant differences between diagnostic groups in the amount of looking at the other's face during the 30 seconds following an initiation with both conditions combined, $F(2,24)=1.68$, $p=.21$. This failure to find differences supported the results of both study I and II.

There was an interesting difference between groups in the amount of looking at the other person's body, $F(2,17)=7.9$, $p=.004$. In condition 1 (no protocol), autistic children looked at the other child's body significantly more times ($M=1.6$, $SD=0.89$) than did children with behavior disorders ($M=0.29$, $SD=0.49$) and normally-developing children ($M=0.38$, $SD=0.52$). There were no accompanying differences in the number of intervals when children were looking at the other's face.

V. Coordination of behaviors

A coordinated behavior, as defined by Mueller and Brenner (1977),

Table III-4

Number of Children Showing Reciprocated Smiles or Unreciprocated Smiles

	Autistics	B. D.*	Normals
Reciprocated smiles	1	5	5
Unreciprocated smiles	8	2	3

* B. D.= behaviorally-disordered children

was any behavior which included looking plus two other discrete behaviors (e.g., smile, talk, object use). It was predicted that autistic children would use fewer coordinated behaviors both to initiate and maintain an interaction than would other children. This hypothesis was partially supported.

Differences between diagnostic groups in the number of coordinated behaviors used to initiate or respond to an initiation were not significant (p=.13). However, younger children (M=1.0, SD=0.97) were significantly different from older children (M=1.86, SD=1.12), $F(1,30)=5.15$, p=.03. In contrast, differences between age groups were not significant in study II and study I.

The type of coordinated behaviors used during initiations was also examined. The number of children combining looking at the other child's face with two or more other behaviors differed between groups, $X^2(4,N=32)=12.29$, $P<.02$. None of the children with autism ever initiated an interaction by using such a combination (see Table III-5).

A univariate analysis of the number of coordinated behaviors used in the 30 seconds following initiations in both conditions suggested differences; diagnosis- $F(2,24)=3.06$, p=.065. Children with autism used the least amount of coordinated behaviors (M=3.8, SD=3.46) with behaviorally-disordered (M=8.7, SD=3.56) and normally-developing (M=7.3, SD=5.37) children using similar amounts. Study II reported similar results.

Use of coordinated behaviors to respond to a partner's last signal in an interaction differed between groups, $X^2(2,N=33)=9.10$, $p<.02$ (see Table III-6). Children with autism and children with behavior

Table III-5

Kinds of Coordinated Behavior Used in Initiations#

	Autistics	B. D.*	Normals
Coordinated behaviors including:			
Looking at other's face	0	7	4
Looking at object	4	0	2
Looking at other's body or looking away	7	3	4

included initiations and responses to initiations in both conditions

* B. D.= behaviorally-disordered children

Table III-6

Number of Responses to the Terminating Signal Using Coordinated and Simple Behavior#

	Autistics	B. D.*	Normals
No. using coordinated behavior	0	0	4
No. using simple behaviors	12	10	7

for both conditions

* B. D.= behaviorally-disordered children

disorders were very similar in that they never used a coordinated behavior in response to the last message sent by their partner.

V1. Verbalizations

Younger children with autism were expected to talk less than younger children in other diagnostic groups during the 30 seconds following an initiation. This hypothesis was not supported. During that time period, two autistic and two normally-developing children did not talk, while all of the behaviorally-disordered children talked. All of the older children talked at least once during the same time period. Differences between diagnostic groups for the frequency of talking were not significant, supporting findings of study I and II.

V11. Terminations

It was predicted that children with autism would terminate an interaction more frequently than would children in other diagnostic groups. Because of procedures used in this study, there were three ways in which an interaction was terminated; the time in the room was over, a child began a new interaction with the second confederate in the room, or at least 20 seconds elapsed during which there was no exchange of signals between partners. The number of children using each method differed between groups: condition 1 (no protocol), $X^2(4, N=32)=13.06$, $p<.02$; condition 2, $X^2(4, N=32)=10.08$, $p<.05$. Children with autism showed a greater number of terminations resulting from 20 second breaks in interaction than did other children (see Table III-7).

Table III-7

Reasons Why Interactions Were Terminated

	Autistics	B. D.*	Normals
Condition 1			
Time over	0	3	4
Started new interaction	2	6	3
20 second break	9	1	4
Condition 2			
Time over	1	2	6
Started new interaction	2	5	2
20 second break	8	3	3

* B. D.= behaviorally-disordered children

Discussion

This study was the third in a series which examined the behavioral topography of autistic children and adolescent's social interactions. It was designed to extend and replicate findings of preceding studies. The results indicate that the children with autism who participated in this study have many of the behaviors necessary to initiate, sustain, and terminate interactions. They were able to initiate interactions with peers in the presence of explicit and implicit cues to do so. No significant differences in discrete behaviors such as looking at or talking to the person with whom they were interacting were noted. Autistic children used coordinated behaviors to initiate and sustain interactions. Despite all these positive findings, they were less likely than other children to consistently sustain an interaction longer than 30 seconds and some of their behaviors differed from those of other children.

One difference was in use of coordinated behaviors. While the autistic children were able to coordinate behaviors to initiate an interaction, they used different combinations than did other children. They never combined two or more behaviors with looking at the other child's face despite the fact that they looked at the other's face as often as did other children. Also, they (and the behaviorally-disordered children) never used coordinated behaviors to respond to the last message sent by their partner in terminating an interaction. Use of coordinated behaviors in such a context might be viewed as signaling a readiness to continue the interaction or to reengage in interaction at a later point.

A second difference lay in the domain of smiling. Children with autism used significantly fewer smiles to initiate or respond to an initiation than did children in other diagnostic groups. Additionally, there was only one person with autism who exchanged smiles in association with the initiation or termination of an interaction, compared to five persons in each of the other groups.

Both of these differences lend support to the position that the social deficits of these particular higher functioning children and adolescents with autism do not lie solely in discrete behaviors such as smiling or gaze. There is also an apparent deficit (or delay?) in coordination of basic behaviors both with other behaviors they produce and with those of other individuals. Successful social interaction requires not only the ability to smile, for example, but the knowledge of when it is appropriate (e.g., returning the smile of another) and inappropriate (e.g., smiling when the other person in crying) to smile.

One unexpected finding of this study was the length of autistic children's interactions. While consistently sustaining an interaction beyond 30 seconds was still problematic (as in study I), eight of the eleven autistic children did so on at least one occasion. The structure of the study may have contributed to this positive outcome. Both autistic children and the confederates entered the room with the knowledge that they were expected to remain there for a minimum of five minutes or until they completed their task. Additionally, while the confederates were not told that they had to interact with the person entering the room, they may have interacted with them in order to obtain assistance in completing their task. Confederates may have felt

that there were expectations for their behavior as a result of their experience in evening programs. At the beginning of each evening, time was spent in dyads playing games and volunteers were encouraged to be nice to their partners. Confederates may have considered the pizza (or sundae) preparation as a form of dyad time and sought to sustain the interaction with children whom they perceived as having problems. Irrespective of the underlying causes of the sustained interaction, use of similar situations in intervention programs is expected to provide a positive learning environment for the development and use of the autistic persons' social skills.

Failure to find significant differences in the amount that children with autism looked at the person to whom they were initiating or with whom they were interacting was replicated in all three studies. However, the structure of the present study, while facilitating sustained interactions, may have compromised the results. Argyle and Cook (1976) reported that when objects of mutual interest to both interactants were present (in this study, the ingredients for a pizza), there was a tendency to look at the objects rather than at each other. Thus, this study did not facilitate eye-to-face gaze. Despite this cautionary note, it does appear that future investigations should focus on duration of gaze or examine the combination of gaze with other behaviors rather than studying gazing behavior in isolation.

Studying greeting and terminating behavior within the context of a sleepover was problematic. Many confederates and subjects had already seen each other prior to their time together in the context of the study. They also knew that they would be spending the rest of the

night together. Laver (1975) suggested such conditions contribute to a failure to use "phatic communion" (i.e., greeting and saying goodbye). Conventionalized greetings are not used when interactants have met earlier and exchanged greetings. Also, aspects of terminations may be less conventionalized if interactants know they will meet again shortly. However, certain patterns of behavior in establishing and terminating interactions were still expected even within these constraints. By locating the study within the context of a sleepover the strong environmental press for the highly conventionalized verbal behaviors associated with greeting and closing behaviors was lost. Despite these difficulties, there were still several verbal salutes. Terminating behaviors (as discussed in the procedures section) were much more limited by the context employed in the study.

Investigations which build upon the present study are needed and should occur in a variety of settings. One ideal situation which has been observed informally is the first night of the evening program when the children or adolescents meet after a couple of months apart. Another is the last night of the program when they know that it will be months before they meet again. Other natural situations could include videotaping the children as they leave for and return from school and interact with parents or siblings, or their arrival at school as they greet teachers and classmates.

Several aspects of ongoing interactions were not addressed in the current study. Some autistic children appeared to use routinized conversations. Content analysis of conversations would identify this behavior and determine topics a child uses to maintain an interaction.

Age and grade level appeared to be frequent topics. Also, more attention must be given to the role of both interactants.

More detailed study of response latencies would be useful. One teenage girl with autism delayed seven seconds before answering a question about her school. Such latencies are markedly different from the 0.77 to 1.34 seconds of most speaker switches (Jaffe & Feldstein, 1970; Knapp, 1978) and also reflects a failure to match latencies which is seen in five year old children. However, her appropriate response allowed the interaction to continue. It did not begin a new interaction which calls into question studies which define any behavior occurring three seconds after another child's social behavior an initiation (e.g., Odom & Strain, 1986).

In another situation, one child asked an autistic boy a question. When there was no immediate response he rephrased the question and received a response. Such observations illustrate the facilitating role of one person's behavior. Throughout the studies, measures of time have not detected significant differences in initiation latencies. However, when the number of behavioral cues of the facilitator is measured, differences emerge. Thus, future studies must measure both time and the interplay of verbal and nonverbal behaviors of both interactants, a very challenging task.

Many more avenues of investigation remain. However, a basis for future studies has been provided by identification of behaviors which some higher-functioning autistic children and adolescents use in initiating, sustaining, and terminating an interaction with peers in one particular, activity-based context.

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DISCUSSION AND SUMMARY

The preceding series of three studies described the nonverbal and verbal behaviors of higher-functioning children and adolescents with autism within three semi-natural interaction settings. The purpose of the studies was to discern patterns of behavior usage in interactions and compare these with those of children and adolescents who were behaviorally-disordered or normally-developing. Observations focused on behaviors used to initiate, maintain, and terminate interactions within these contexts.

One difficulty in studying the social interactions of persons with autism is the limited population available to a researcher. Conclusions which can be reached on the basis of a single study are severely constrained. In this research, although several studies were conducted, the same group of autistic subjects were studied. Each study sought to extend the findings of the other studies in the series by utilizing different contexts (structured vs. unstructured, activity-based vs. interpersonal greetings), different persons (familiar peer vs. familiar adult), and different methodologies (protocols vs. spontaneous behaviors). Thus, to some degree the reliability of the findings could be demonstrated.

The relatively small number of subjects sometimes made it difficult to statistically verify trends in behavior (e.g., study of initiation times in study II and III). Although all autistic and behaviorally-disordered subjects shared the behavioral patterns which qualified them for their respective diagnostic label, the range of

disability and its manifestation varied. For example, one boy with autism talked continuously throughout one five minute observation period on topics such as toilet bowl cleaners and movies. On the other hand, two girls with autism never spoke unless a question was addressed to them specifically. Indeed, for consistent group differences to emerge against this background of large individual differences in a small sample lends weight to the importance of the findings.

I. Quantitative measures of interactions.

Quantitative measures such as time, number, and duration were used to measure interaction across the three studies. Results indicated that individuals with autism initiated interactions less frequently and tended to greet others less readily than did their normally-developing counterparts. An encouraging finding was that all of the individuals initiated interactions at least twice and, with one exception, each person made at least one spontaneous verbal greeting. Thus, these social acts can occur but are seen infrequently, as noted both in this research and in that of other investigators (Lord, 1984; Odom & Strain, 1986).

Why initiations by autistic children are rare is not clear. It is possible that these children are simply not interested in social interactions and lack motivation to seek social contacts (Lord & Garfin, 1986). Therefore, context (or task) becomes particularly important, since purely social motivation may be insufficient. In addition, structure (i.e., explicitly communicated expectations for particular behaviors) may play a role as well. Activities in the

present studies included those with built in opportunities for interaction (e.g., air hockey). Our structuring of the context appeared to be more successful in study III than in study I. In the free play situation of study I, initiations often resulted in interactions lasting less than 30 seconds. In the more structured task-oriented situation of study III, many autistic children participated in interactions well beyond 30 seconds. Thus, in some situations sustained peer interactions are possible.

II. Use of basic discrete behaviors in interactions

One emphasis of all three studies was use of behaviors which form the basis of social interactions. Specific behaviors studied were verbalizations, gaze, and smiling. No significant differences were found between diagnostic groups during the initiation, maintenance, and termination of an interaction in frequency of looking at or talking to the person with whom they were interacting. There were also no significant differences in the use of these behaviors in greeting another person. While these findings were certainly not predicted, their consistency across the series of studies cannot be denied.

Even when the coding system for types of looking behaviors became more fine-grained in study III, differences in the frequency of that particular behavior were not noted. Only when type of looking behavior (e.g., eye-to-face gaze, looking away) was examined in relationship to other behaviors (e.g., approaching) did differences in frequency of use emerge. In study III, autistic children did not look at the other person's face when using coordinated behaviors to initiate an interaction. This finding is discussed more fully below.

Unlike findings for gaze and verbalizations as isolated behaviors, there were marked differences in the use of smiles as a discrete behavior in all three studies. A cautionary note must be injected before discussing the results. In most cases (e.g., study II & III) the number of smiles was so small even for the highest frequency group (e.g., $\underline{M}$=1.2) that qualitative results may be small or reflect the contribution of particular individuals despite significant quantitative results. However, again consistency across studies lends credence to the results. In the structured context of study III, persons with autism smiled less frequently during initiations and showed a lower incidence of exchange of smiles during both initiations and terminations. They smiled less during verbal greetings to an adult (study II) even when the adult was smiling at them. Results of study I suggested that unlike other diagnostic groups, smiling during initiations did not increase with age for autistic children.

One explanation for a lack of smiling may be that the autistic children were simply not having a good time. Given that the children were in a familiar setting with familiar persons participating in self-selected activities (at least in study I), at a simple level this hypothesis seems unlikely. All of the autistic children were regular members of the social group and, according to their parents, enjoyed attendance. However, there is still the possibility that they enjoyed these activities less than other children (and were under a "smiling threshold"). Alternatively, a lack of social smiling may be a basic deficit associated with the disorder of autism (Freeman et al., 1981; Langdell, 1981). A failure to smile in response to smiles of others

(i.e., study II & III) suggests a possible deficit in the ability to coordinate one's own behavior with the behavior of others.

There are several other possible explanations for the low frequency of smiling. Langdell (1981) postulated that the process of learning to associate expressions with feelings may be impaired. Social smiles are seen in normally-developing children by the time they are two to four months of age (Knapp, 1978). As the caregiver interacts with the infant and imitates this smile, the infant comes to associate the expression with certain feelings. With time, seeing another smiling face may cause the child to smile because of the feeling evoked rather than merely imitating the other's expression. Langdell (1981) suggested that infants with autism may produce few expressions or produce them inconsistently, making it difficult for the caregiver to imitate the expressions or attribute emotion to them. Thus, the process whereby expression is linked to feeling state may be short-circuited by an impairment of the innate component of smiling.

Further support for a deficit related to emotions comes from Hobson (1986, in press). He used a series of studies to explore the ability of autistic children to recognize emotions as expressed in drawings of facial expressions and gestures, and videotapes of gestures, vocalizations, and contexts. Based on the results, he concluded that these children were unable to 'sense' the emotional meaning associated with the expressions irrespective of the modality used (Hobson, in press) and had to adopt alternative strategies to make sense of others' behaviors.

However, there are still aspects of the results that are only

partially explained by the discussion above. Normally-developing children who smiled as part of the greeting process were probably not doing so because they were particularly happy. Rather, by some process yet to be clarified, they had learned that when one is greeting another or ending an interaction, one smiles. Verbal and some nonverbal aspects of ritualized behaviors may be taught by the caregiver (Corsaro, 1979). Encouraging the child to say "Hello" or "Goodbye" at appropriate times and saying things like "look at me when I'm talking to you" or shaking the child's hand in play are all examples of ways in which the behaviors may be taught. However, nonverbal behaviors such as looking away while approaching and smiling may not be taught. Higher-functioning children with autism appear to have acquired the more explicitly taught verbal (as evidenced by no significant differences in talking) and possibly gaze (as evidenced by no significant differences in looking at their target) facets of interactions, but have not acquired the accompanying nonverbal behaviors. If the acquisition of such behaviors associated with specific situations is learned, then one could also expect differences with age (see discussion below).

III. Coordination of discrete behaviors in interactions

Throughout the studies, coordination of the individual component behaviors and their use in interactions was examined. As noted earlier, there were relatively few discrete behaviors which higher-functioning children and adolescents with autism used less frequently than did children in other diagnostic groups. Differences were seen in the combination of the discrete behaviors with other discrete

behaviors. Autistic children used significantly fewer coordinated behaviors (as defined by Mueller & Brenner, 1977) to greet a familiar adult than did children in other groups. In study III, the differences between groups on this dimension were similar.

A more interesting and consistent result was that children with autism tended to combine behaviors differently in specific situations. These included results such as a lower frequency of combining looking away and approaching (study II), a failure to look at a child's face in addition to other behaviors while initiating (study III), and a failure to use coordinated behaviors in response to a partner's termination of an interaction (study III). Likewise, an increased frequency of looking at the other child's body during the maintenance phase of an interaction may be the result of coordination problems. This latter finding may have occurred because the child with autism looked up at the other interactant while he or she was looking down at the object being used. The normally-developing child was better able to gauge when to look up and thus, was not coded as looking at the body but as looking at the face.

The basis for difficulties in coordination of behaviors is not readily apparent. The ability to combine behaviors emerges after development of the discrete skills and is facilitated by participation in peer interactions (Brownell, 1986; Mueller & Brenner, 1977). Older children who have had more opportunities to participate in peer interactions should be more adept at combining discrete behaviors and

use them more frequently than do younger children. Support for this expectation came from the finding in study II and III that younger children used fewer coordinated behaviors to initiate an interaction than did older children. Thus, the differences observed in the group with autism may be due to a delay in development compounded by limited experience in peer relations (Lord, 1984). For the group with autism, older children with autism consistently used coordinated behaviors slightly more often ($\underline{M}$=1.0) than did younger children with autism ($\underline{M}$=0.67) which may indicate that the problem is a delay. On the other hand, autistic children did not show the same developmental trend for smiling as other groups, suggesting that not all the deficits associated with autism are developmental delays. Further study of the manner in which coordinated behaviors develop in both normally-developing and autistic children is definitely needed. Questions such as when do children learn to combine looking away and approaching, which behaviors do they consistently combine first, and in which situations are specific behaviors combined (e.g., terminating interactions) remain unanswered.

Altogether, these results have important implications for intervention. Teaching individual discrete behaviors may be necessary in earlier stages of intervention. However, this study suggests that for this higher-functioning group of autistic children and adolescents the benefits of such approaches in the long-term are questionable. The long-term deficits were not so much at the level of discrete behaviors as in the combination and appropriate use of the behaviors in appropriate situations. Thus, remediation needs to occur in situations

which are most conducive to use of the problematic behaviors. For instance, sustaining interactions in a free play situation is difficult for younger autistic children. Structuring the situation so that it is well within the child's communicative and cognitive abilities, employing activities which the child enjoys, and explicitly communicating the expectation that the child play with a normally-developing peer for a specified amount of time are ways of facilitating ongoing interactions. Once the child is involved in the interaction much can be learned from the peer as he or she models behaviors. Lord and Garfin (1986) outlined ways in which to encourage peer interaction.

IV. General discussion

One other result which merits discussion is the presence of age effects on various dependent variables. Younger children had significantly fewer interactions resulting in ongoing (lasting 30 seconds or more) interactions (study I) than did older children. They used objects more often (study I), smiled less often (study I), and used coordinated behaviors less often (study III) in initiating interactions than did older children. Even though it was intended that the social skills measured in these studies were the most basic, it is important to recognize that developmental differences did occur within the normally-developing children for some behaviors. Social development continues, even with very basic behaviors, throughout childhood.

The methodological implications of these developmental differences for the study of social skills in autism are two-fold. First,

normally-developing or developmentally-matched children must always be included as a control group in research studies (Yule, 1978). Otherwise, the pattern of social behavior may be incorrectly attributed to a deficit in skills rather than a delay. Secondly, the social behaviors of persons with autism need to be studied across ages in order to identify areas in which there is a failure to develop (e.g., smiling). Remediation efforts can then be focused at the appropriate levels.

Children with behavior disorders received little attention throughout the studies beyond reporting results. Although the differences were not statistically significant, some children with behavior disorders did not greet an adult as readily as did normally-developing children and younger behaviorally-disordered children had fewer ongoing interactions across studies and thus resembled the children with autism. Such findings are in keeping with their known deficits in social relations which was one of the criteria for their inclusion in the study. Overall, however, this group was very much like the normally-developing group. Their pattern of results contributes to our understanding of the deficits of autism. For example, behaviorally-disordered children consistently smiled as much or more than normally-developing children. Thus, the factors which this group shares with the autistic group such as unfavorable peer relations, special education settings, and lower cognitive functioning cannot be seen as causal explanations of autistic children's deficits in this area at least not at a simple level. There were findings which were similar for the behaviorally-disordered children and the autistic

children such as the failure to use coordinated behaviors to respond to the last signal sent by their partner which merit further attention.

There are many avenues of investigation yet to be pursued which can serve to elucidate the results of this series of studies. Some of these have been mentioned in the discussion sections of each of the studies. One particular aspect of interactions which requires much more attention is that of interaction maintenance. Ways of sorting out the contribution of each interactant to the sustaining of the interaction requires both theoretical and methodological attention. In order to fully grasp the processes involved in an interaction, much more sophisticated equipment and methodologies are needed. Latencies, turn-taking, synchrony, and mutuality are but a few of the variables which could be studied and thus, contribute to our understanding of the abilities which a person with autism requires in order to participate in successful mutually-satisfying interactions.

Altogether, the results of these studies increase our understanding of the nonverbal and verbal behaviors used by persons with autism as part of their social interactions. Directions for future study are identified. There are areas which theories of both autism and normal social development need to address. The challenge which remains is to use the knowledge acquired to date to help those higher-functioning children and adolescents with autism whose increasing desire for social contacts is hampered by their lack of ability to effectively initiate, sustain, and terminate an interaction.

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GLENROSE HOSPITAL

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PHONE 471-2262

CONSENT FORM

Your child is participating in a social group/research project which provides an opportunity for children with language and social delays to play in a structured learning environment with other children. You are welcome to observe the children from the observation rooms during the program.

We will observe the children for a portion of the program to determine how children get other children to play with them. We will also be videotaping the children to make sure we do not miss any important information during the observation time.

All information will be treated as confidential. We will use it only for the research project. We hope the program will be an enjoyable time for each child as well as providing valuable information to help us design educational and treatment programs for children with delays. If you have any concerns, please feel free to contact us at 471-7926.

Sincerely

Catherine Lord, Ph.D.
Associate Professor
Department of Pediatrics
University of Alberta

Joyce Magill, M.Sc.
Program Coordinator
Department of Psychology
~~Gl~~enrose Hospital

Please return this portion if you are willing to have your child participate.

I give my consent for my child_____ to participate in
(child's name)
the evening program.

_____ _____
Signature of parent or guardian Date